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ABSTRACT

CITY III is a computer-assisted simulation game in which participants make decisions affecting the economic, governmental, and social conditions of a simulated urban area. In CITY III, the computer stores all the relevant statistics for the area, updates data when changes are made, and prints out yearly reports. The computer also simulates decision-makers, influences, and markets outside the local metropolitan area; performs certain routine procedures which would be time consuming for players; and acts as a bookkeeper, recording all the transactions of the players and balancing their financial accounts. At the beginning of the CITY III game, participants are divided into social and economic decision-makers. These decision-makers then elect the players who will perform the roles of the governmental sector. After the players receive a report which explains the status of their various functions, they may begin to analyze their problems and formulate solutions. The player's manual presents the basic information for each decision-making sector. This information includes the numerical parameters for each sector as well as a description of the types of decisions that may be made. The manual describes the methods for inputing data to the computer and interpreting the computer output. A set of "Master Sheets" summarizes all the numerical parameters for four versions of CITY III. (JY)

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CITY III

PLAYER'S MANUAL

ENVIROMETRICS, INC.

October, 1970

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8

I. INTRODUCTION

CITY III is a computer-assisted simulation game in which participants make decisions affecting the economic, governmental and social conditions of a simulated urban area. Through the use of a computer, the simulated urban system reacts as any real city would to all types of decisions. It changes in response to those human actions which guide and shape its development. Each player in CITY III becomes a representative of one of three basic groups -- economic, social or governmental -- which constitute CITY III's basic structure. The interrelated decisions made by the members of these groups will cause the simulated city to change in composition and size. These decisions are recorded during each round of play by the computer which acts as an accountant and indicates the effects of these actions on the decision-makers and upon the simulated city. The effects are shown on readily available computer printouts. CITY III is called an operational simulation because it is a computer-assisted game in which participants assume decision-making functions within sectors of the urban system.

A. The Computer

The computer performs several major functions in CITY III. First, it stores all the relevant economic, social and governmental statistics for the area; updates data when changes are made; and prints out yearly reports. Second, the computer acts as an outside system, simulating decision-makers, influences and markets that are outside the local metropolitan area. For example, the computer simulates both a national business cycle and the probabilities of federal-state aid. It also determines interest rates on most loans and rates of return on speculative and conservative investments made by players. Third, the computer performs certain routine functions or processes that would be time-consuming if the players themselves were to perform them. For example, the computer assigns workers to jobs under the assumption that workers will attempt to earn as much money as possible. Other processes include assessing all property, assigning buyers of goods and services to shop at particular commercial establishments, assigning children to public or private schools based upon the capacity and quality of the public schools, and assigning population units to residences based on their desirability. The computer also simulates the migration cycle which moves population units into, out of, and within the metropolitan area in response to the attractive and/or unattractive features of the area.

Finally, the computer acts as a bookkeeper. It records all the transactions of players, deducts their expenditures and adds their incomes to their financial accounts.

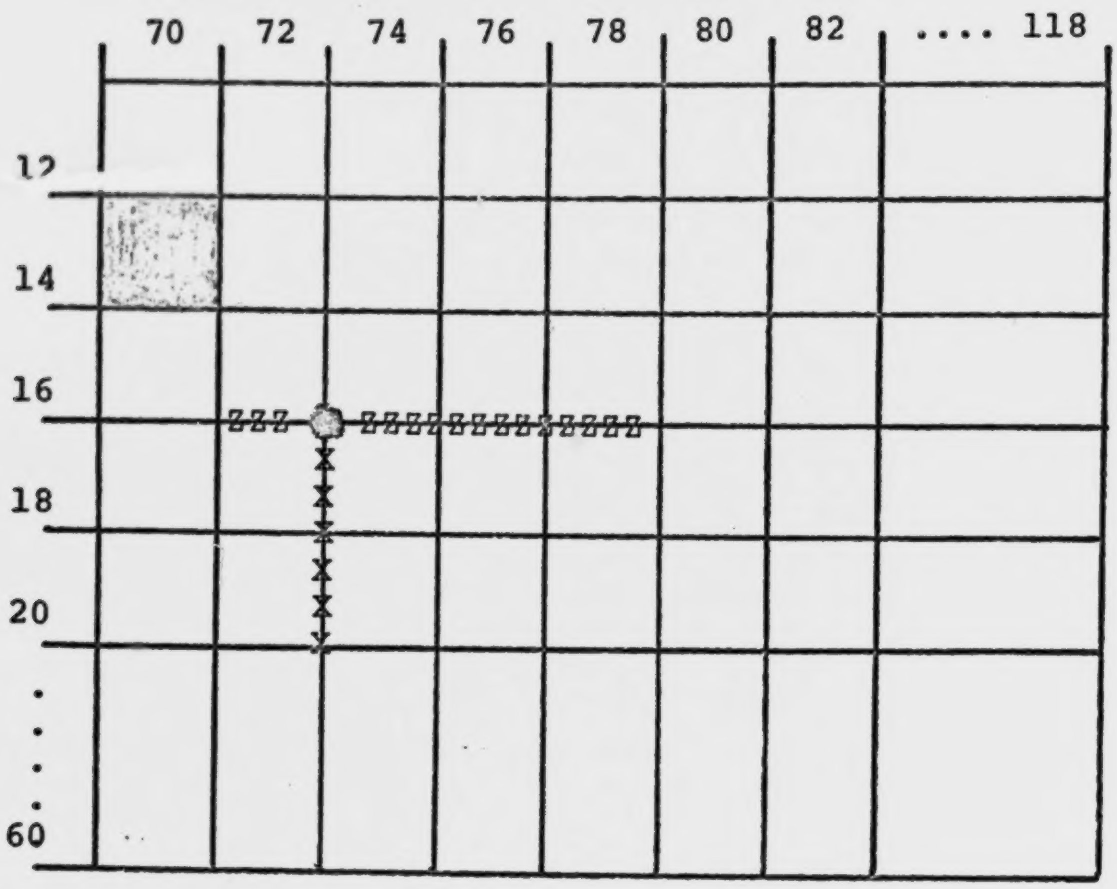
The computer does not have a large vocabulary. Thus, players must write their decisions or questions in a language developed specifically for the computer. This language is an abbreviated code which the computer can understand. For example, when decision-maker A representing the economic sector wants to change a salary or rental figure, he will write $CVPT/#A/S for salary or $CVPT/#A/R for rent instead of the entire word. In addition to using this coded language, all information must be fed into the computer in a certain order. This format must be followed when sending information to the computer or in asking questions of it. It generally requires that a player fill in certain blanks on the input decision form before the information is put into the computer.

B. The Game Board

CITY III's metropolitan area is represented on a game board consisting of 625 squares. Each square represents one square mile of land. Many of these land parcels are unowned parcels at the beginning of play. Unowned parcels may be purchased and developed by decision-makers during the course of the game. As players continue to play CITY III over the course of several rounds, the physical changes inherent in all cities will be visible on the playing board.

The game board and all computer maps are keyed to a coordinate system of even numbers. Each square mile parcel can be identified by its coordinates. Horizontal coordinates range from 70 to 118 and vertical coordinates range from 12 to 60. Intersections are identified by odd-numbered coordinates and highways are identified by even-odd (east-west) or odd-even (north-south) coordinates. In all cases, the horizontal coordinate (i.e., the large number) is identified first.

For example, in the map below the shaded parcel is identified as 7014. Further, the four mile highway indicated by ZZZ is identified as 7217, 7417, 7617, and 7817, while the two mile highway indicated by XXX is identified at 7313, 7320. The intersection marked by ● is located at 7317.



C. The Three Sectors

CITY III contains three basic decision-making sectors: economic, social and government. Every city contains these three vital sectors whose interactions cause the city to either grow and prosper or stagnate and decay. Decisions made by one group ultimately affect others and one group often works against another group to achieve its goals. For example, proposed commercial developments by an economic group in a predominantly residential area can be blocked by residents of that area just as proposed changes by the government sector can be opposed by those participants in the economic or social sector. In light of this, CITY III has the facility for such social reaction strategies as strikes, boycotts, and voting and economic pressures such as bribes.

1. The Economic Sector

The activity in the economic sector is that which gives any city one of the basic reasons for existence. Economic decision-makers are those businessmen who operate industrial, commercial, and residential establishments. Upon receiving output at the beginning of the round, economic decision-makers review their economic status and make decisions for the present round. The various economic activities in CITY III have the following characteristics:

a. Basic Industry

Heavy Industry (HI), Light Industry (LI) and National Services (NS) spend money for business goods and business services, utilities, a labor force, transportation, and taxes. In order to influence the production of industrial output to be sold to the national markets at prices determined by national business conditions (the computer), owners of basic industries can make a wide variety of decisions. These decisions include purchasing land, changing salaries or maintenance levels, boycotting business goods and business services establishments, acquiring loans, building new businesses, upgrading existing businesses, or demolishing old ones.

b. Construction Industry

A CI can build, upgrade and demolish any economic development (except a CI) in addition to schools, municipal service plants and highways in the government sector. The owner of the CI specifies the price at which a job will be performed on the basis of the equipment, materials, labor and transportation required for that job.

In some cases the game will be played without the construction industry, and firms from outside of the local area will perform all construction.

c. Commercial Establishments

Business goods (BG) and business services (BS), personal goods (PG) and personal services (PS) spend money on many of the same items as basic industry in order to maintain a level of service capacity. This service capacity is consumed or partially consumed by local customers which include Heavy Industry (HI), Light Industry (LI), National Services (NS), other commercial establishments and the population units (Pl's) who live in the city. Owners of the commercial establishments may make most of the decisions that owners of basic industries make in addition to setting prices for their products.

d. Residences

Single-family (RA), townhouse (RB), and high-rise (RC) residence units spend money on personal goods and personal services, utilities, and taxes, and earn income based on rent charged and the number and type of occupants residing in their housing units. Owners of residences may make the same types of decisions made by owners of basic industry in addition to setting the rent paid by their tenants.

2. The Social Sector

Decision-makers in the social sector represent the citizens who live and work in CITY III. People are simulated in terms of population units (Pl's). Each population unit represents 500 people. However, population units are divided into three socio-economic groups; high income (PH), middle-income (PM) and low-income (PL). Because each class possesses its own expectations and behavioral patterns, each will prefer different types of residence, job, and schooling, etc. Social decision-makers can vote on behalf of the Pl's which they represent. Voting power is dependent upon the number of population units controlled, the number of registered voters in each, and their socio-economic class. Social decision-makers can also direct the population units under their control to boycott places of employment (HI, LI, NS, BG, BS, PG, PS, Schools, Municipal Services) or shop (PG, PS) locations. Social decision-makers can also allocate leisure time of their population units to be spent in any of four basic activities: extra work, adult education, politics, and recreation. The amount of time spent on each of these activities has an effect on the socio-economic status and/or the dissatisfaction index of people living within the city. Social decision-makers also set a dollar value for the time which they spend traveling to and from work. This affects the mode of transportation to which they will be assigned by the computer.

3. The Government Sector

In CITY III the government sector deals with the problems of education, highways, fire and police protection, planning, zoning, utilities, and bus and rail transportation. The government sector is divided into two basic components. The first component includes elected officials: the Chairman and the Council. These officials are elected by the social decision-makers representing the people who live in each jurisdiction. The Chairman and his council set tax rates, approve budgets, grant subsidies and appropriations, and make appointments. Appointed officials named by the Chairman are heads of these five governmental departments: Schools (SC), Municipal Services (MS), Highways (HY), Planning and Zoning (PZ), and Utilities (UT). The Bus and Railroad Companies are semi-private organizations which also may be appointed by the Chairman. Players representing these departments make decisions which include allocating capital and current funds, changing salaries and maintenance levels, requesting federal-state aid, changing district boundaries, constructing or demolishing public buildings, upgrading public buildings, changing levels of service, and transferring cash between accounts.

D. How to Begin a play of CITY III

At the beginning of the CITY III game, participants will be divided into social and economic decision-makers. These decision-makers will then nominate candidates for the offices of Chairman and Council. Social decision-makers will then vote. Whether an election be by simple majority or plurality is at the discretion of the players. The victorious chairman then appoints his bureaucratic officials to make up the rest of the government sector. Players will then receive output which explains the status of their various functions. Upon receiving output, players may then begin to interpret it and think of decisions and courses of action that may solve their problems.

E. The CITY III Round

In CITY III, a round represents a year of change in the life of the simulated area. From the standpoint of the participants, however, a round may be thought of as a decision-making cycle which starts when they receive output and ends when they feed their decisions to the computer.

During the early part of a typical round, decision-makers will be simultaneously reviewing their computer output and attempting to organize their possible actions. Economic decision-makers, for example, will probably bid on the various unowned parcels of land and attempt to acquire desirable land from other participants. They may attempt to secure loans from local or outside sources, apply for zoning changes, request utility expansions, and increased highway access. At the same time, social decision-makers might be bargaining for higher wages, requesting improvements in local schools and municipal services, and trying to promote those politicians who are for a favorable platform in the upcoming elections.

Meanwhile, the governmental decision-makers may be receiving requests from the economic and social decision-makers to lower taxes, improve schools, provide better municipal services, expand highways, build additional utilities, enlarge the park system, and improve other services. Budget officials are faced with the task of finding additional revenue to meet expanding public needs and dividing appropriations among the many local departments, all of which have attempted to justify their expanding budgets.

Toward the middle of the round, it becomes clear to many decision-makers that all of their requests will not be granted. Thus, trade-offs and bargains must be made. Elected officials will begin to worry about staying in office. Departments must plan to operate with less funds than they had requested. Low income representatives begin to make their political power felt. High-income representatives attempt to maintain their status. Businessmen begin to look for short-cuts to reduce their losses and increase their activity and profit-making ventures.

As the round approaches a conclusion, the participants formalize the bargains they have made, continue to feed their decisions into the computer, terminate the negotiations on new wage levels, new prices and new rents, carry on their boycotts and complete any other possible actions. When the round ends, participants campaign and carry out new elections, hold town meetings, debrief their actions, and develop new strategies while the computer is performing its functions and preparing new output on the status of the simulated city.

F. Organization of the Player's Manual

Chapters II, III and IV of this manual are organized to present basic information for each decision-making sector. This information includes the numerical parameters for each sector as well as a description of the types of decisions that may be made.

Chapters V, VI and VII represent the "cookbook" sections of the manual. The "cookbook" sections are designed primarily for easy reference during the course of a round when players need additional information. Chapter V describes the computer output with which the players will be dealing. Chapter VI considers the mechanics of filling out input decision forms so that decisions may be accepted by the computer in the proper manner. Chapter VII includes the Master Sheets which summarize all the numerical parameters of CITY III.

II. THE ECONOMIC SECTOR

A. The Economic Decision-Maker

The Economic Sector of CITY III represents the private and entrepreneurial functions of an urban system. An economic decision-maker (represented by A, B, C, etc.,) is distinguished from other sector participants of CITY III by the fact that he owns things. He owns land, for example. Some of this land is developed and some is undeveloped. His ownership of developed land gives the economic decision-maker the responsibility of operating the developments which are built there. Another asset of the economic decision-maker is cash. Each economic decision-maker begins playing CITY III with a cash balance. He may use his balance to acquire new land, build another new business, upgrade old ones, invest in venture capital, and others. In a sense, the city's economic activity provides a rationale for its existence and its dynamic growth and future development. In CITY III, therefore, the economic decision-maker is not only an individual concerned with maximizing his own profit, but he is also a person whose decisions, biases and judgments will greatly influence and change the simulated area.

B. Economic Land Uses

There are eleven types of economic land uses in CITY III. Each of these land uses represents a development which is owned and operated by an economic decision-maker. These land uses are divided among basic industry, construction industry, commercial establishments and residences. They include:

Basic Industry

HI	Heavy Industry: steel, petroleum, etc.
LI	Light Industry: electronics, pharmaceutical, etc.
NS	National Services: insurance, consulting, etc.

Construction Industry *

CI	Construction: building, upgrading, demolition

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*As noted earlier, in some plays of the game the construction industry will not be used.

Commercial Establishments

BG	Business Goods: intermediate products, raw materials, etc.
BS	Business Services: computer, accounting, legal, etc.
PG	Personal Goods: food, drugs, appliances, etc.
PS	Personal Services: banking, restaurants, etc.

Residences

RA	Single family housing
RB	Townhouses, garden apartments
RC	High rise apartment buildings

C. Common Characteristics of Economic Land Uses

All economic land uses share certain common characteristics. These characteristics are development level, land requirements, value ratio, depreciation, maintenance level, and utility requirements.

1. Development Level

The development level for a particular land use represents the size and the number of buildings which make up a certain industrial, commercial or residential development. Development levels range from 1 to 3 for all land uses except residences which have 8 potential development levels. On the parcel notations, development level appears as the number to the right of the land use abbreviation. For example, an HI3 is a heavy industry of the third level of development.

Development level is included as the characteristic of economic land uses because the number representing a development level is a multiplier by which to determine other numbers throughout the book. For example, you will discover that an HI1 occupies 28% of a square mile parcel. To determine how much land an HI3 occupies, you merely multiply 28% times 3. The same holds true for other numbers, such as those representing employees required, typical construction costs, purchases of goods and services, design capacity, etc.

2. Land Requirements

All economic establishments occupy a given amount of land on a square mile parcel. The amount of land required for a particular establishment varies by its type and level of development. Land requirements for the eleven land uses in CITY III are listed below:

Land Use	Land Requirements (Percent of Square Mile Parcel)
HI1	28%
LI1	24%
NS1	20%
CI1	20%
BG1	24%
BS1	20%
PG1	16%
PS1	12%
RA1	12%
RB1	12%
RC1	12%

3. Value Ratio (VR) and Quality Index (QI)

Value ratio is a measurement of the physical condition of a building. It ranges from a high of 100 (a newly constructed or restored building) to a low of 0 (a completely deteriorated structure -- worse than a slum). VR is defined as the ratio of the present value of a development to its original value. Value ratio affects the output or capacity of a business, i.e., a value ratio of 50 means that output or capacity will be 50 percent of what it would be otherwise.

VR applies to all buildings except residences. The physical condition of residences is measured by a quality index (QI). Like VR it also ranges from 0-100 but new residences may be built at one of seven different QI's (40, 50, 60, 70, 80, 90, 100). All other developments must be constructed at a VR of 100.

4. Depreciation

The value of all economic developments decreases during each round of play of CITY III. The rate at which a development depreciates is determined by (a) an annual depreciation rate (i.e., time), plus (b) the amount of depreciation caused by the quality of the municipal services[1] serving the parcel on which the development is located, and (c) for commercial establishments only, the depreciation caused by use. The following table shows depreciation for the land uses in CITY III:

Land Use	Annual Rate of Depreciation (percent of original value ratio or quality index)	Plus Function of MS Quality	Plus Function of Use
HI	3.1	3.1 Q*	None
LI	2.6	2.6 Q	None
NS	3.0	3.0 Q	None
CI (equipment)	None	None	4.0
BG	1.5	2.5 Q	1.5 C**
BS	2.0	3.0 Q	2.0 C
PG	1.6	2.6 Q	1.6 C
PS	2.2	3.2 Q	2.2 C
RA	2.0	1.0 Q	None
RB	3.0	1.0 Q	None
RC	4.0	1.0 Q	None

* Q is $\frac{\text{MS Use Index} - 100}{100}$

** C is (actual use of commercial establishment/design capacity of commercial establishment)

Q and C have no effect if negative

5. Maintenance and Normal Operation

Since developments depreciate at a rate which is specified as a percent of their original value, the most striking result is a decreasing value ratio (or quality index). The owner of a building may maintain it at a specified value ratio (or quality index) by specifying the maintenance level (0-100) at which he wants the development to remain. The costs of maintaining the value ratio of a building at a specified level are automatically deducted from the balance of the economic decision-maker by the computer. The costs of maintenance of a development involve purchases of goods and services. Basic Industry, Construction and Commercial Establishments all buy business goods and business services. HI, LI, NS, and CI can buy these goods and services at competitive prices from BG and BS establishments within the system or from the Outside System at fixed prices of $130,000 per unit of BG or BS. BG and BS establishments, however, cannot buy goods and services from themselves. Their maintenance costs are, therefore, taken up in purchase at fixed costs from the Outside System, and RA, RB, and RC do not require business goods and services from maintenance. Rather, they purchase personal goods and services either from PG and PS establishments within the system or from the Outside System at fixed prices of $13,000 per unit of PG or PS. BG, BS and PG, PS requirements for 1% maintenance or renovation (of original value ratio or quality index) are summarized below:

---

[1] Municipal Services (MS) is a governmental department in CITY III. Its main function is to provide services such as police and fire protection to the community. The quality of services which the MS department provides influences the rate at which the value ratio of a development declines over time.

Land Use	Maintenance Requirements; Purchases from:		
	BG	BS	Outside
HI1	9 units	1.5 units	
LI1	4 units	2.5 units	
NS1	1 unit	4.0 units	
CI1	10.5 units	1.5 units	
BG1			$250,000 (fixed cost)
BS1			$100,000 (fixed cost)
PG1	2 units	1 unit	
PS1	.75 unit	.25 unit	
	PG	PS	
RA1	.7 unit	.3 unit	
RB1	4.0 units	2.0 units	
RC1	17.0 units	8.0 units	

Now for an example. Let us suppose that economic decision-maker A owns an HI with a value ratio of 90. Suppose it depreciates at 5% (remember, depreciation is expressed as a percent of original value ratio. The original value ratio of a HI has to be 100 -- it cannot be built below that). If A has specified a maintenance level of 90, the value ratio of the HI which he owns will remain 90 in the next round. The requirements for maintaining it at 90 would be 45 units

(BG) and 7.5 units (BS). In effect, economic decision-maker A is countering the natural effects of depreciation, which, had he not specified a maintenance level of 90, would have forced the value ratio to have fallen to 85.

All land uses except residences also require BG and BS for normal operation. These BG and BS can be purchased either from local BG and BS establishments at competitive prices or from the Outside System at a fixed cost of $130,000 per unit. The BG and BS requirements for normal operation are summarized below for level one developments:

Land Use	Requirements for Normal Operation: Purchases From :		
	BG	BS	Outside
HI1	420 units	60 units	
LI1	190 units	100 units	
NS1	60 units	230 units	
CI1	(Material requirements vary by job)		
BG1			$83,000* (fixed cost)
BS1			$58,000* (fixed cost)
PG1	.037 unit*	.017 unit*	
PS1	.03 unit*	.01 unit*	

*These costs and requirements are per CU of output.

6. Utility Requirements

All economic land uses (except CI) require utilities such as water, gas, electricity and sewerage. These services are provided by the Utility Department, which may be public or private. The amount of utility units consumed and the max-minimum level of utility service required by the various economic land uses of the first level of development are summarized on the next page.

Land Use	Utility Consumption Requirements (units)	Minimum Level of Utility Service
HI1	402	5
LI1	135	2
NS1	76	1
BG1	112	2
BS1	71	1
PG1	99	1
PS1	77	1
RA1	4	1
RB1	26	1
RC1	117	2

The "typical" price of Utility Service is $10,000 per unit but this price may be changed at the discretion of the Utility Department.

7. Employment Requirements

Employees are essential to the functioning of all non-residential land uses (HI, LI, NS, BG, BS, PG, PS) in CITY. These employees are hired from the population units (1 population unit = 500 persons) which inhabit the simulated area. The number of workers in a given population unit is related to the population unit's class (high, middle, or low). Socio-economic class also determines the salary range which is paid to a worker. Information summarizing typical salaries and number of workers per population unit is given below:

Class	Number of Workers per Population Unit	Typical Annual Salary Per Worker	Typical Annual Salary Per Population Unit
High	120	$10,000	$1,200,000
Middle	160	5,000	800,000
Low	200	2,500	500,000

Each commercial (BG, BS, PG, PS) and industrial (HI, LI, NS) land use has a different employment requirement which describes the number and socio-economic mix of full-time and part-time employees necessary to produce the maximum amount of output (for industry) or capacity units (for commercial establishments).

The optimum mix is summarized below, along with the typical wage bill which is paid if these requirements are met. Part-time requirements are in parentheses.*

Land Use	Employment Requirements			Typical Wage Bill
	PH	PM	PL	
HI1	21(0)	29(1)	9(0)	$53,700,000
LI1	15(0)	11(1)	11(1)	33,600,000
NS1	23(1)	9(0)	9(0)	40,500,000
CI1	(Hires by job only)			
BG1	14(1)	7(0)	8(0)	27,600,000
BS1	20(1)	9(0)	9(0)	36,900,000
PG1	8(0)	13(1)	22(2)	32,800,000
PS1	6(0)	11(1)	16(2)	25,800,000

Economic decision-makers do not actually hire and fire employees in CITY. Each round, the computer assigns population units to work locations by means of the employment process. Essentially, the computer optimizes employment by assigning people to work at places where their net salary is maximized (i.e., base salary minus transportation costs to work). Employers in CITY include HI, LI, NS, CI, BG, BS, PG, PS in the economic sector and the School Department, Municipal Service Department and Bus and Rapid Rail Departments in the governmental sector. (See Figure A.)

In general, the employment process will assign PH workers to high-income jobs, PM workers to middle-income jobs, and PL workers to low-income jobs. However, if there are shortages of jobs for any of the respective classes, population units may become employed at lower class levels. For example, if there are not enough high-income positions available, PH workers will be the first selected to fill middle-income positions and receive middle-income salaries. There is also a built-in bias for workers to continue to work at previous places of employment.

---

*Social decision-makers allocate time for part-time employment. 80 time units fulfill one full-time job requirement. For further information, see "Time Allocation," page 41.

EMPLOYMENT PROCESS

GOAL: MAXIMIZE NET SALARY, WHICH EQUALS GROSS SALARY MINUS TRANSPORTATION COSTS. A POPULATION UNIT WILL NOT FILL A JOB VACANCY WHERE NET SALARY IS NEGATIVE.

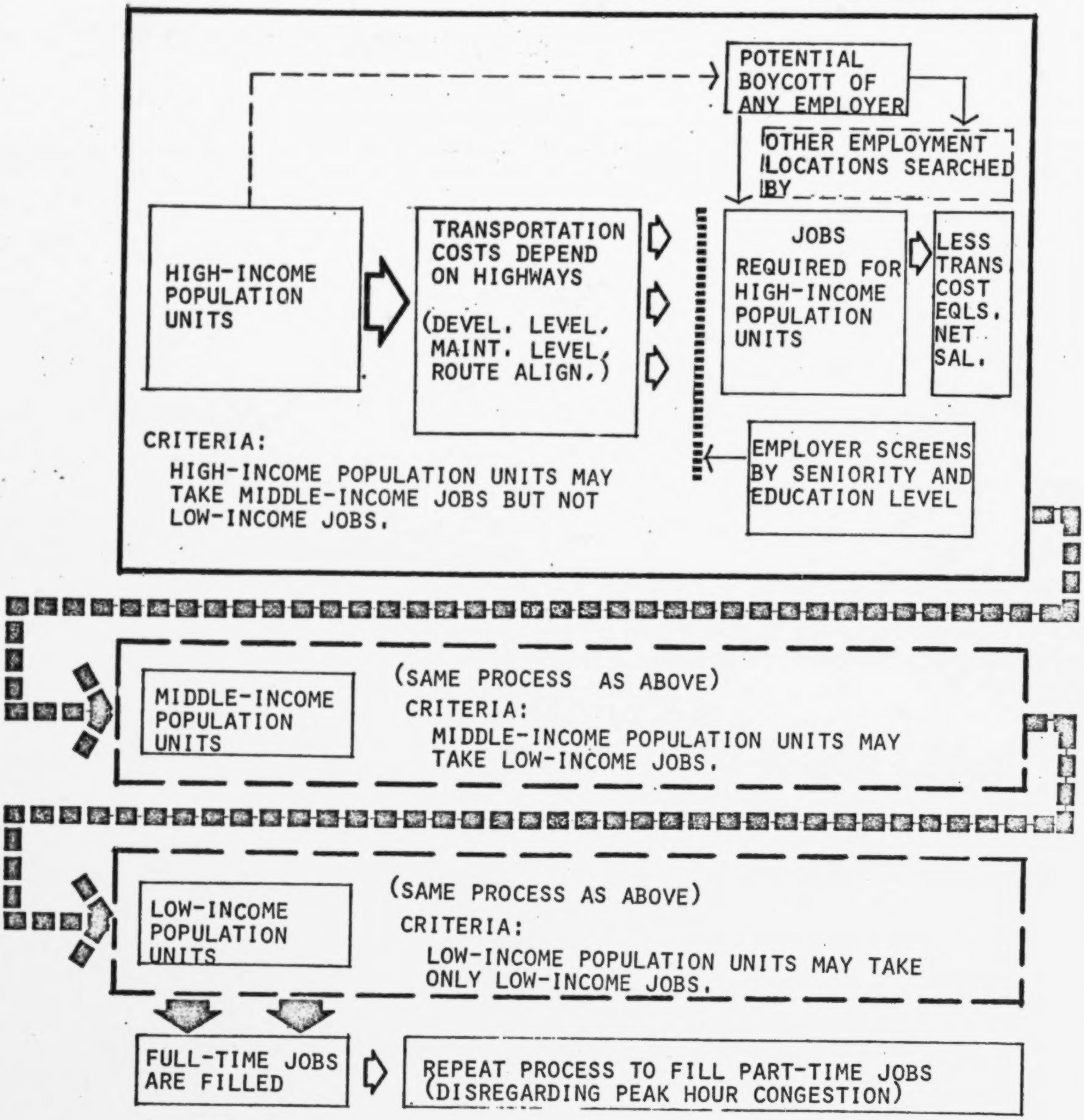
POTENTIAL BOYCOTT OF ANY EMPLOYER
OTHER EMPLOYMENT LOCATIONS SEARCHED BY
HIGH-INCOME POPULATION UNITS
TRANSPORTATION COSTS DEPEND ON HIGHWAYS
(DEVEL. LEVEL, MAINT. LEVEL, ROUTE ALIGN.)
JOBS
REQUIRED FOR HIGH-INCOME POPULATION UNITS
LESS TRANS COST EQLS. NET SAL.
EMPLOYER SCREENS BY SENIORITY AND EDUCATION LEVEL
CRITERIA:
HIGH-INCOME POPULATION UNITS MAY TAKE MIDDLE-INCOME JOBS BUT NOT LOW-INCOME JOBS.
MIDDLE-INCOME POPULATION UNITS
(SAME PROCESS AS ABOVE)
CRITERIA:
MIDDLE-INCOME POPULATION UNITS MAY TAKE LOW-INCOME JOBS.
LOW-INCOME POPULATION UNITS
(SAME PROCESS AS ABOVE)
CRITERIA:
LOW-INCOME POPULATION UNITS MAY TAKE ONLY LOW-INCOME JOBS.
FULL-TIME JOBS ARE FILLED
REPEAT PROCESS TO FILL PART-TIME JOBS (DISREGARDING PEAK HOUR CONGESTION)

FIGURE A

8. Taxes

All economic decision-makers pay local and federal-state taxes. These taxes are collected automatically by the computer and paid to the local government or the Outside System.

There are two types of local taxes which the Chairman can levy on the economic sector. These include property taxes and sales taxes. Property taxes are applied to all privately-owned land as well as to developments. Sales taxes are applied to all purchases of goods (from BG, PG) and all purchases of services (from BS, PS) by a particular development.* All local tax rates are variable and are set by the Chairman.

The federal-state tax rates are fixed. There are two types of federal-state taxes: business income and sales. These taxes are applied to developments owned by an economic decision-maker. The rates for these taxes are summarized below:

Business Income (State)	5% of (gross income minus salaries, minus goods and service payments, minus maintenance payments, minus state sales tax and local sales tax and minus property tax)
Business Income (Federal)	22% of first $25,000 of (gross income minus salaries, minus goods and services payments, minus maintenance payments, minus state sales tax, minus local sales tax, minus property tax, minus state income tax) plus 48% of rest (minus the same deductions).
Sales Tax (State)	3% of the total purchases from BG and BS or PG and PS establishments.

---

*For further information for determining local tax payments, see page 50.

9. Capacity

In CITY III, all non-residential land uses have design and effective capacities. In the case of basic industry, capacity may be thought of as capacity units (CU's) of output that can be produced and sold to the Outside System. The capacity of a construction industry is determined by its level, the value ratio of its equipment, and the labor actually hired. For commercial establishments capacity may be thought of as units (CU's) of goods and/or services supplied to customers in the local system at prices determined by the owner of a particular establishment. The design capacity for the various economic land use types is summarized below:

Land Use Type	Design Capacity
HI1	1000 units
LI1	1000 units
NS1	1000 units
CI1	1000 units
BG1	5000 units
BS1	1500 units
PG1	16,000 units
PS1	8000 units

There are two influences in CITY III which reduce design capacity to form effective capacity. When an industrial or commercial establishment does not meet its employment requirements, its design capacity is reduced in the following manner:

$$\frac{\text{Pl's actually employed}}{\text{Pl's required}} \times \text{Design Capacity} = \text{Capacity due to Employment Mix}$$

For example, to produce design capacity (output) an HI1 needs to employ a total of 21 PH's, 30 PM's and 9 PL's (including part-time workers). Suppose the computer assigns the necessary number of PH's and PL's, but because a competitive salary is not offered to middle-income workers, it assigns only 6 PM's. In reducing design capacity the computer would perform the following operation:

$$\frac{36}{60} \times 1000 = 600 \text{ capacity units of output.}$$

Value ratio also acts in conjunction with employment mix to determine effective capacity. In this case, capacity due to employment mix is multiplied by VR/100. In other words, if the HI1 in the example above has a VR of 80, its effective capacity would be 480 (600 x 80/100).

In some cases, a BG, BS, PG or PS may sell more capacity units than its effective capacity. In such a case, the demand for goods and services is greater than the supply. If the actual number of units sold by a commercial establishment is greater than its effective capacity, it will depreciate at a faster rate due to overuse.

D. Effects of the Outside System on the Economic Sector

The Outside System should be thought of as the outside influences, primarily economic, on the local system. It is the source of all money which enters the local economy from the outside as well as the destination of all money leaving the local economy. The primary influences of the Outside System on the local economy include the business cycle, federal-state taxes and aid, and migration.

Essentially, the business cycle is the barometer of how the economy outside the local area is faring. Consequently, it indicates the probability of success in economic ventures and investments. In CITY III, the business cycle plays an important role in determining the price paid for basic industry (HI, LI, NS) output. The price per unit of output varies directly with the business cycle. During periods of prosperity, prices are higher, and during periods of recession prices are lower. Like all other outside influences, the fluctuations of the business cycle are handled entirely by the computer.

The business cycle also affects the interest rates on loans from the Outside System and rates of return on speculative and conservative investments.

Federal-state taxes are also paid to the Outside System at fixed rates. There are three types of federal-state taxes: Business Income, Personal Income, and Sales. Federal-state aid is available to several government departments for certain current and capital expenses.

The remainder of this section will deal in greater detail with the specific characteristics of the various economic land uses in CITY III. These characteristics differ according to the classification of the land use into the following categories: Basic Industry, Construction Industry, Commercial Establishments and Residences.

E. Basic Industry

1. Income

Each of the three types of basic industry in CITY III (HI, LI, NS) sells its output to the Outside System. The income to the local system for these sales is primary input for local economic activity. The maximum output for an HI1, LI1, or NS1 is 1000 units. The average price per unit of output is determined by the Outside System. The average prices per unit of output are $190,000 for HI, $115,000 for LI, and $110,000 for NS. These prices will change somewhat depending on outside economic conditions. The price paid for HI output is the most variable and the price paid for NS output is the least variable in the business cycle.

2. Expenditures

Expenditures for basic industry are for maintenance and normal operation, utilities, salaries, transportation and taxes. Maintenance and normal operation, utilities and salaries were discussed earlier (see page 12).

Transportation costs are incurred by HI, LI and NS when acquiring goods and services from BG and BS necessary for maintenance and normal operation, and (except for NS) for shipping finished goods to terminals from which they are distributed to the Outside System. These costs vary according to type of road, user, and destination.

	Transportation Costs Per Mile on HY3*		
User	To BG	To BS	To Terminal**
HI	$ 500/CU	$500/CU	$850,000
LI	500/CU	500/CU	256,000
NS	500/CU	500/CU	

---

*A HY3 is the largest road and therefore the least expensive for transportation. Costs are double on a HY2 and triple on a HY1.

**BG and BS and terminal users pay an additional charge that is equal to one mile of travel along a HY3.

F. Construction Industry

1. Income

a. Prices

A construction industry (CI) earns income by charging prices for the construction, upgrading, and demolition of economic and governmental land uses in CITY III. The prices that a CI charges are not fixed; they depend upon the costs to the CI and the outcome of negotiations between it and a player. The typical prices charged are listed below. These prices assume that typical salaries are paid to CI workers, that the distance to the building site is five miles, that the distance to BG and BS (for purchase of materials) is two miles and that the CI is operating at 80% of capacity. Further, these figures include a rate of return of 22%.

Development	Typical Construction Price Charged*	Typical Demolition Price Charged
Economic Sector		
HI1	$105,000,000	$21,000,000
LI1	65,000,000	13,000,000
NS1	50,000,000	10,000,000
BG1	25,000,000	5,000,000
BS1	10,000,000	2,000,000
PG1	30,000,000	6,000,000
PS1	10,000,000	2,000,000
CI1	120,000,000**	60,000,000***
RA1	1,000,000	200,000
RB1	6,000,000	1,200,000
RC1	25,000,000	5,000,000
Governmental Sector		
SC1	27,000,000	5,400,000
MS1	30,000,000	6,000,000
HY1	800,000	160,000
TM1	14,000,000	2,800,000

A first approximation of what it would cost the construction company to build a particular land use can be obtained by calculating: the number of workers required and the wages that would have to be paid them, the number of equipment units required, and the purchase from BG and

---

*If the construction industry is not being used in a game, all construction prices are "typical".

**The construction cost of a CI is paid to the Outside System. A CI cannot build a CI.

***The owner of a CI1 receives this amount for equipment sold (i.e., demolition).

BS of the material needed to build a structure given the specified number of equipment and material units and labor units. For example, an NS1 requires 250 units of equipment and materials and 250 units of labor. This means it will require five population units of workers from each of the three income classes, yielding a typical wage bill of $12,500,000. Two hundred and fifty material units from business goods and business services would yield approximately $11,000,000 worth of BG purchases and $1,500,000 worth of BS purchases. A construction industry owner could then estimate transportation costs and taxes, mark up this figure for the desired profit, and use the result as an offer price in negotiations with the client.

b. Contracts

Players, both government and economic, negotiate contracts with the construction industry for new construction, upgrading and demolition. The contract is filled by the construction industry with the assistance of the player paying for construction. Owners of proposed construction sites are responsible for checking on land and zoning requirements, utilities, and money (their cash balance on the computer printout) before submitting the contract. These requirements must be met before the contract is accepted by the computer. The construction contractor is paid in the round when the contract is classified by the computer output as "pending"; the construction industry's employees and BG and BS are also paid at this time. The new building becomes operative after one round of construction time.

The contract will not be accepted by the computer if the above requirements are not met.

2. Expenditures

A CI spends money for employment, equipment and materials, maintenance, transportation and taxes. Maintenance and taxes were discussed earlier (see page 12).

a. Employment

A CI employs equal numbers of workers from population units of each socio-economic class but allocates the workers to construction sites in smaller units. This is because most construction jobs do not require labor in even multiples of the number of workers in a population unit. A particular construction job will require a number of units of labor. One population unit from each of the three classes supplies 50 units of labor. Units of labor required to build depends on type of land use. No labor is required for demolition.

To determine the full-time employment request in each class for a CI, the computer divides by 50 the total number of labor units required to perform all of the CI's contracts. The remainder is half of the part-time employment needed in each class. For example, suppose a CI1 had a contract to build a PG1 (150 labor units) and a BG1 (125 labor units). The full-time employment request is 5 PH, 5 PM, and 5 PL (275 ÷ 50 = 5 and 25/50). The part-time request is 50 time units PH, 50 units PM, and 50 units PL (25 x 2).

b. Equipment and Materials

Construction also requires equipment and materials. Equipment is a capital investment and is purchased from the Outside System in the process of forming a CI. The amount of equipment owned by a CI is a function of its level of development, i.e., a CI1 has 1000 units, a CI2 has 2000 units and a CI3 has 3000 units of equipment.

Materials are purchased either from local BG and BS establishments at competitive "prices" or from the Outside System at fixed costs of $130,000 per unit of BG or BS.

For a CI, one unit of material is the equivalent of .44 BG units and .06 units of BS.

Labor, equipment and material requirements for the various land uses are summarized below:

	Construction			Demolition	
Land Use	Units of Equipment	Units of Material	Units of Labor	Units of Equipment	Units of Material
Economic Sector					
HI	525	525	525	105	359
LI	325	325	325	65	222
NS	250	250	250	50	171
BG	125	125	125	25	86
BS	50	50	50	10	34
PG	150	150	150	30	103
PS	50	50	50	10	34
RA	5*	5*	5*	1	3
RB	30*	30*	30*	6	21
RC	125*	125*	125*	25	86

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*These requirements of equipment, materials and labor are for residential construction at QI = 100. New housing can be built at a lower quality index (as low as QI = 40). Requirements diminish according to the equation: $R = 1/200 * S(100+X)$ where S is the units of equipment and material or the units of labor required to build a residence at QI = 100 and R is the units required to build the same type of residence at QI = X.

Governmental Sector					
SC1	135	135	135	27	92
MS1	150	150	150	30	103
HY1	4	4	4	1	3
TM1	70	70	70	14	42

As for other businesses, a CI's employment and value ratio affect its capacity. The computer accepts contracts requiring a sum of equipment units up to 1000 times the CI's level. Later, after each CI has received its employees, the computer determines the status of each CI's new contracts. The number of equipment units which can be used is value ratio/100 times design capacity. If the number of equipment units required for new contracts exceeds that amount, the computer will defer contracts, starting with the last accepted, until the number of equipment units required is less than value ratio/100 times design capacity.

For example, suppose the computer accepted contracts for a CI1 for an HI1 (525 equipment units) and an LI1 (325 equipment units). The CI has a value ratio of 80. It can therefore handle 800 equipment units of construction. (80/100 * 1000). Since the contracts require 850 equipment units, the last submitted must be deferred.

A CI's capacity for contracts requiring employment (all non-demolition contracts) is value ratio/100 times employees hired/employees requested times design capacity. Only construction contracts are deferred if there is an employment shortage at a CI.

Deferred contracts are the first in the "accepted" list next round and have the least chance of being deferred next round. A CI with deferred contracts can accept fewer new contracts (in terms of equipment units) than a CI with the same level and value ratio but no deferred contracts.

c. Transportation

A CI incurs transportation costs when traveling to BG and BS establishments to purchase material and when going to a building site. Transportation costs are \$220 (to BG) and \$30 (to BS) per mile on HY3, per unit of materials purchased, and to a building site, \$60 per mile on HY3 per unit of equipment. A CI can travel to a building site on a road under construction. Further, a CI can travel on road beds (all parcel boundaries where there is not a developed road) at 4 times the cost to travel on a HY3. When a CI is building a highway, the transportation costs are calculated on the basis of the distance to the nearest intersection at the end of each individual road segment, i.e., each segment is treated separately.*

G. Commercial Establishments

1. Buyers and Sellers

The commercial land uses in CITY III (BG, BS, PG, PS) trade with each other, with other establishments in the economic sector and with the government and social sectors. The buyer-seller relationships with commercial establishments is best summarized in the following tables.

Sellers	Buyers		
	Economic Sector	Governmental Sector	Social Sector
BG	HI, LI, NS, CI, PG, PS	SC, MS	
BS	HI, LI, NS, CI, PG, PS	SC, MS	
PG	RA, RB, RC		PH, PM, PL
PS	RA, RB, RC		PH, PM, PL

Economic and social decision-makers who purchase goods and services from commercial establishments do not make contracts with individual BG, BS, PG and PS establishments. Rather, economic and social customers are assigned to BG, BS, PG, and PS establishments by the Commercial Process. The government departments requiring goods and services for their operation and maintenance, however, do make contracts with individual BG and BS establishments. In effect, government decision-makers must perform the commercial process themselves if they want to acquire goods and services at the least cost. Governments do not pay transportation costs for goods and services.

---

*NOTE: A CI builds a road starting from its northern-most or western-most point.

2. The Commercial Process

In the commercial process, economic and social sector purchasers of goods and services are assigned by the computer to commercial establishments on the basis of least total price (i.e., price charged plus transportation costs). In the commercial process there is a built-in bias for buyers to shop at the same establishment as in the previous round. Further, there is also a bias against shopping in overcrowded establishments. (See Figure B.)

3. Boycott

Economic and social decision-makers may boycott commercial establishments. When a boycott occurs, under no circumstances will a boycotting customer buy from the specified commercial establishment.

4. Income

Commercial establishments earn income from the sale of their goods and services. The amount of goods and services sold depends upon the capacity at which a particular establishment is operating. The maximum capacity (units produced) is 5,000 for a BG1, 1,500 for a BS1, 16,000 for a PG1, and 8,000 for a PS1. The maximum capacity, of course, can be reduced by insufficient employment and by the value ratio of less than 100. Prices charged per capacity unit are determined by the owner of the individual establishments. Capacity and typical prices are summarized below:

Land Use	Maximum Capacity (Units)	Typical Price/Unit*
BG1	5000	$100,000
BS1	1500	100,000
PG1	16000	10,000
PS1	8000	10,000

5. Expenditures

Commercial establishments, like industrial land uses, spend money for maintenance and normal operation, utilities, employment and taxes. These expenditures were discussed earlier (See page 12).

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*An owner may charge above or below this figure, but he must remember that a buyer can purchase BG, BS, PG and PS units from the Outside System at $130,000 per unit of BG and BS or $13,000 per unit of PG and PS with no transportation costs to the purchaser.

COMMERCIAL PROCESS

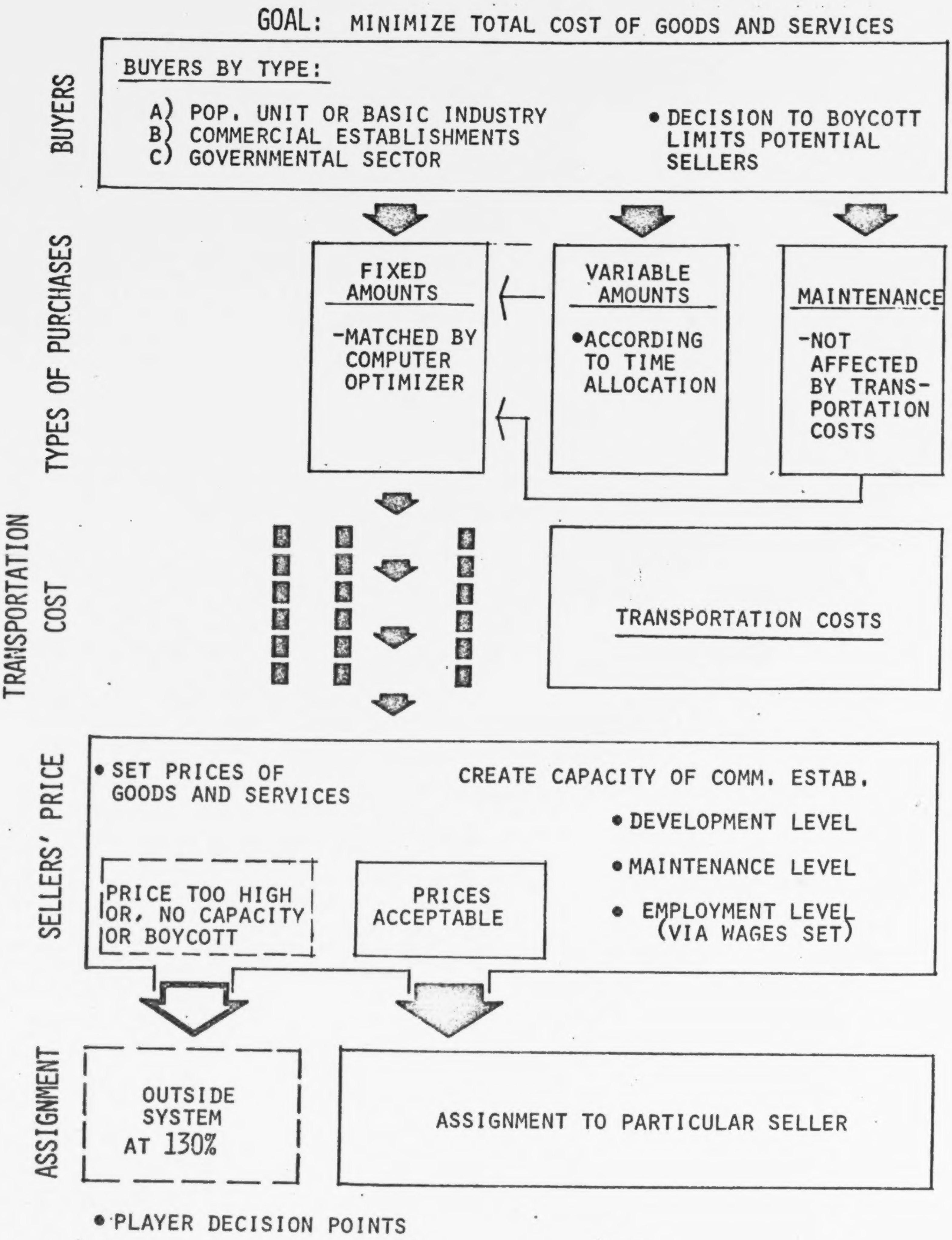
GOAL: MINIMIZE TOTAL COST OF GOODS AND SERVICES
BUYERS
BUYERS BY TYPE:
A) POP. UNIT OR BASIC INDUSTRY
B) COMMERCIAL ESTABLISHMENTS
C) GOVERNMENTAL SECTOR
• DECISION TO BOYCOTT LIMITS POTENTIAL SELLERS
TYPES OF PURCHASES
FIXED AMOUNTS
-MATCHED BY COMPUTER OPTIMIZER
VARIABLE AMOUNTS
•ACCORDING TO TIME ALLOCATION
MAINTENANCE
-NOT AFFECTED BY TRANSPORTATION COSTS
TRANSPORTATION COST
TRANSPORTATION COSTS
SELLERS' PRICE
• SET PRICES OF GOODS AND SERVICES
CREATE CAPACITY OF COMM. ESTAB.
• DEVELOPMENT LEVEL
• MAINTENANCE LEVEL
• EMPLOYMENT LEVEL (VIA WAGES SET)
PRICE TOO HIGH OR, NO CAPACITY OR BOYCOTT
PRICES ACCEPTABLE
ASSIGNMENT
OUTSIDE SYSTEM AT 130%
ASSIGNMENT TO PARTICULAR SELLER
• PLAYER DECISION POINTS

FIGURE B

In addition, all businesses except BS incur transportation costs. BG incurs costs for receiving goods from the Outside System at a terminal and PG and PS incur costs for purchasing goods and services from within the system. These costs are:

Transportation Costs per Capacity Unit of Output Per Mile Along HY3*

Land Use	To Terminal	To BG	To BS
BG1	$400	--	--
BS1	--	--	--
PG1	--	$17	$ 8
PS1	--	15	5

H. Residences

1. Income

Economic decision-makers own 3 types of residences (RA, RB, RC) in CITY III. Like owners of commercial establishments, owners of residences earn income by charging prices (i.e., rents). The number of population units which can live in a given residence depends on its type and its level of development. The quality index for residences indicates the physical condition of the housing; the higher the QI (0-100), the better the conditions. Further, the QI and the amount of overcrowding will determine whether or not a particular socio-economic class will move into a given residence. The table below summarizes the number of occupants which the 3 types of residences (level 1) can accommodate in addition to indicating the minimum QI requirements for each socio-economic class:

Population Class	Design Capacity (Occupants per Population Unit)			Minimum QI
	RA1	RB1	RC1	
High (PH)	1	6	25	70
Middle (PM)	1.5	9	37.5	40
Low (PL)	2	12	50	20

---

*A HY3 is the largest road and, therefore, the least expensive to travel on. Costs are double on HY2 and triple on HY1. A journey of one mile on an HY3 is added to the actual distance travelled.

Owners of residences specify rents on the basis of the rent which they would charge low-income population units. Middle-income renters pay 1.33 times as much and high-income renters pay 2 times as much. The principal criteria for determining rents is the quality index. An economic decision-maker cannot expect people to live in his housing with a QI of 50 when they can find housing with a QI of 85 and comparable other features. (See "Migration," in Chapter IV: The Social Sector.) The typical rents that can be charged to tenants of each class are summarized below.

Residential Type	Typical Rents		
	PH	PM	PL
RA	$330,000	$200,000	$140,000
RB	330,000	200,000	140,000
RC	330,000	200,000	140,000

The maximum rent which can be charged is $210,000 per PL1.

Total income from operating a residence is, therefore, determined by multiplying the number of occupants from each class times the rent charged to each class. For example, suppose economic decision-maker B owns an RA2 with 6 PH's and 9 PM's living there. He charges a rent of $160,000 per PL. His income from that residence is $3,835,200 [($160,000 x 1.33 x 9) + ($160,000 x 2 x 6)]. Typical income, assuming that the unit is occupied at design capacity by one class and typical rents are charged, is below:

Residential Type	Income From Typical Rent		
	PH	PM	PL
RA	$ 330,000	$ 300,000	$ 280,000
RB	1,980,000	1,800,000	1,680,000
RC	8,250,000	7,500,000	7,000,000

2. Expenditures

Owners of residences spend money chiefly for maintenance, utilities and taxes. These expenditures were discussed earlier (see page 12).

I. Economic Sector Decisions

An economic decision-maker in CITY III can make any or all of the following decisions during a round of play: invest in or sell stocks; borrow and lend money; bid on or purchase land; change rents, prices, salaries, and maintenance levels; transfer cash; boycott; construct and demolish developments.

1. Bid on and/or Purchase Land or Developments ($PU)

An economic decision-maker may purchase land from either of two sources: another player or the computer. When purchasing land from another player, the terms of the purchase are settled upon by mutual agreement. When purchasing a parcel of land, an economic decision-maker must purchase all of the parcel that is not owned by the government or in preempt uses.

A participant in the economic sector may also purchase land from outside interests represented by the computer. When bidding on outside land, one must determine the fair market value. It is suggested that one use the values shown on the Auction Asking Price Map to determine the value of computer-owned parcels. Each round the computer selects some outside-owned land to be auctioned. The Auction Asking Price Map shows these parcels. Other outside-owned land may also be bid for, but the chances of acceptance are much less. Factors to consider when bidding on land are proximity to other developments, access by roads, zoning and availability of utilities. There is a charge of 2% of the bid price on any bid on land owned by the computer, regardless of the bid's success or failure.

2. Change Rents, Prices, Salaries, and Maintenance Levels ($CVPT)

Owners of all residences may specify the rents which they charge to their tenants. In CITY III rents are specified in terms of the rent charged to one low-income (PL) population unit in thousands of dollars (Rent/PL1/$1000).

Owners of BG, BS, PG, PS can set the price paid for one capacity unit (CU) of goods and/or services produced. When setting prices, an economic decision-maker must realize that customers can boycott BG, BS, PG, and PS establishments or go to the Outside System and purchase goods and services at $130,000 per unit (BG, BS) and $13,000 per unit (PG, PS).

Owners of HI, LI, NS, BG, BS, PG, PS, and CI all employ workers. They set the salary which they pay their workers at each establishment which they own. Typical salaries per worker and per population unit of the socioeconomic classes are summarized below:

Class	Number of Workers per Pl	Typical Salary Per Worker	Typical Salary Per Pl
High (PH)	120	$10,000	$1,200,000
Middle (PM)	160	5,000	800,000
Low (PL)	200	2,500	500,000

Finally, economic decision-makers can also set the maintenance level of their buildings. The maintenance level indicates the minimum value ratio at which a particular land use is to be maintained. In effect, this allows a decision-maker to counteract the effects of depreciation (i.e., a declining value ratio). Owners of residences can not raise the maintenance level of an RA, RB, or RC more than 20 points above the lowest value ratio which the building has ever had.

In renovating or maintaining a land use, it is necessary to purchase goods and services from either within the local system or from the Outside System. The requirements of goods and services for maintenance and renovation were given earlier (see page 13).

3. Transfer Cash ($CASH)

An economic decision-maker may transfer cash assets to another economic decision-maker or to the capital or current account of a governmental department.

4. Boycott ($BYCT)

Economic and social customers are assigned to BG, BS, PG and PS locations by the commercial process. In this process, the computer assigns customers on the basis of least total cost (i.e., prices charged plus transportation costs). Further, there is a built-in bias for buyers to shop at the same establishments as in the previous round. Economic decision-makers, however, can boycott commercial establishments from which they buy goods and/or services for normal operation of their buildings and/or maintenance. In doing this, they specify which of their developments will not purchase goods and/or services from certain PG, PS, BG, and BS establishments in the city. A boycott remains in effect until it is stopped. If a boycott occurs, the customers will be assigned to other shop locations or to the Outside System at fixed costs of $130,000 per unit of BG or BS and $13,000 per unit of PG or PS.

5. Lend, Borrow, and Invest ($OTHER)

An economic decision-maker may lend money to or borrow money from another decision-maker. In such a case, the interest rate is set by mutual agreement but the term of the loan must be either 2 or 25 years. An economic decision-maker may also borrow money from the Outside System (OU). When doing such, the term of the loan is specified by the borrower but the interest rate is set by the Outside System (i.e., the computer). No economic decision-maker may have more than 80% of his total assets in outstanding principal for loans in the Outside System at one time.

Economic decision-makers may also invest in conservative or speculative stocks. The returns of these investments are determined by the Outside System and range from -1% to 10% for speculative investments and from 5% to 7% for conservative investments.

6. Build, Upgrade, or Demolish Developments ($BUILD or $OUBLD)

Economic decision-makers may build new developments or upgrade (i.e., add an additional level of development) or demolish existing ones. In CITY III all construction can be accomplished either through contracts with a local construction industry or by the Outside System at 1.3 times the typical construction costs. Demolition costs by the Outside System are one-fifth of the Outside System construction costs. The typical construction costs for local firms are summarized on the following table:

Land Use Type	Construction Costs	Typical Demolition Costs
HI1	$ 105,000,000	$ 21,000,000
LI1	65,000,000	13,000,000
NS1	50,000,000	10,000,000
CI1	120,000,000	60,000,000*
BG1	25,000,000	5,000,000
BS1	10,000,000	2,000,000
PG1	30,000,000	6,000,000
PS1	10,000,000	2,000,000
RA1	1,000,000**	280,000**
RB1	6,000,000**	1,200,000**
RC1	25,000,000**	5,000,000**

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*The owner of a CI1 receives this amount for equipment sold (i.e., demolition).

**These figures are for building residences when value ratio = 100. For building residences at other value ratios, see the table on the next page.

Value Ratio	Typical Construction Costs		
	RA	RB	RC
40	$700,000	$4,200,000	$17,500,000
50	750,000	4,500,000	18,750,000
60	800,000	4,800,000	20,000,000
70	850,000	5,100,000	21,250,000
80	900,000	5,400,000	22,500,000
90	950,000	5,700,000	23,750,000

When building or upgrading developments, players should check to see that the proper level of utility service is installed at the construction site. In no case will construction be completed when there are insufficient utility units provided. The utility requirements for economic land uses are:

Land Use Type	Utility Units Required	Minimum Level of Utility Service
HI1	402	5
LI1	135	2
NS1	76	1
BG1	112	2
BS1	71	1
PG1	99	1
PS1	77	1
RA1	4	1
RB1	26	1
RC1	117	2

Proposed construction will also be rejected unless it conforms to zoning codes established by the Planning and Zoning Department. These codes are:

Any Use	00
Any Business	10
Any Manufacturing	20
HI	21
LI	22
CI	23

Any Non-Manufacturing	30
NS	31
BG	32
BS	33
PG	34
PS	35
Any Residential	40
RA	41
RB	42
RC	43
Parkland	50

In CITY III, there can be only one type of economic land use on a parcel. Furthermore, if accepted, all construction is completed one full round after the contract is submitted to the computer, unless the CI does not acquire sufficient labor. If a CI has a labor shortage, some contracts are deferred until the next round.

III. THE SOCIAL SECTOR

Social decision-makers in CITY III (identified) as AA, BB, CC, etc.) represent people who live and work in the simulated area. These people perform several different activities: they vote, they boycott, they save and spend money, and they allocate time to such activities as extra education, part-time employment, politics, and recreation. These activities are the chief assets of the social decision-maker. With these assets, he can exert a powerful social voice in the community and subsequently influence the decision-making process in the economic and government sectors of CITY III.

A. Population

People in CITY III are divided into population units (Pl's) of 500 persons each. In addition, population units are divided into three socio-economic classes: High (PH), Middle (PM), and Low (PL). Population units share certain characteristics, which are summarized below:

Class	Number of Workers	Number of Students	Normal Registered Voters
PH	120	130	200
PM	160	140	140
PL	200	100	100

1. Income

Population units in CITY III can earn income by working full or part-time for employers in either the economic (HI, LI, NS, CI, BG, BS, PG, PS) or government (SC*, MS, BUS, RAIL) sectors. The typical salaries for full-time employment are $10,000 per PH worker, $5,000 per PM worker, and $2,500 per PL worker. These salaries are set by individual employers (i.e., economic and governmental decision-makers).

Unemployed population units can earn income from welfare payments which are determined by the chairman.

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*NOTE: Only the School Department hires part-time workers in the government sector.

2. Expenditures

Each round, population units spend money for certain required items: personal goods (PG) and personal services (PS); rent; transportation (to PG and PS establishments and to work); private adult education (if time is allocated); private education (if sufficient public education is not supplied by the School Department); recreation (if time is allocated); and taxes. These requirements are summarized below:

	PH	PM	PL
PG Requirements	34 units	28 units	21 units
PS Requirements	16 units	11 units	7 units

[NOTE: Population units can purchase goods and services from local PG and PS establishments at competitive prices (the typical price is $10,000 per unit of PG or PS) or from the Outside System (if a boycott of a PG or PS is in effect or if local supply is insufficient) at a fixed price of $13,000 per unit.]

Typical Rent	$330,000	$200,000	$140,000

[NOTE: Rents are set by individual landlords, i.e., economic decision-makers who own residences. Actual rents may vary above or below these typical figures.]

To Work*		PH	PM	PL
	Base:	$210/worker	$190/worker	$140/worker
Plus	HY1:	60/worker/mi	55/worker/mi	50/worker/mi
	HY2:	50/worker/mi	45/worker/mi	40/worker/mi
	HY3:	40/worker/mi	35/worker/mi	30/worker/mi
To PG	Base:	$50 per unit	$50 per unit	$50 per unit
	HY3:	50/unit/mi	50/unit/mi	50/unit/mi
To PS	Base:	$50 per unit	$50 per unit	$50 per unit
	HY3:	50/unit/mi	50/unit/mi	50/unit/mi

[NOTE: There are three types of highways in CITY III: HY1, HY2, and HY3. An HY3 is the largest highway and, therefore, the least expensive to travel.]

*Costs are for uncongested roads. If a road is overcrowded by 20%, it will take a Pl 20% longer to travel on it and cost 20% more than the normal cost.

Transportation Charges by Bus
- Rates are set by the Bus Company -

Transportation Charges by Rail
- Rates are set by the Rail Company -

	PH	PM	PL
Private Adult Education (cost per time unit)	$3,000	$3,000	$3,000
Recreation (consumption units per time unit)			
PG	.1	.05	.025
PS	.075	.05	.0

[NOTE: These costs for adult education and recreation are fixed per unit of time that is allocated. Costs for recreation involve purchases of PG and PS and are added to normal expenditures for PG and PS.]

Private Education per Pl (children) (if sufficient public education is not supplied)	$37,500	$25,000	$12,500

Taxes	PH	PM	PL
Local			
Income Sales Automobile	Local tax rates are set by Chairman.		
Federal-State			
Income	12%(of wages)	6%(of wages)	3%(of wages)
Sales	3% of total purchase of PG and PS		

B. Dissatisfaction

The people in the simulated area will react to any decisions which affect them. The computer calculates the amount of dissatisfaction which a population unit experiences. Dissatisfaction is measured in terms of a population unit's dissatisfaction with its residence (housing dissatisfaction) and its personal situation in the community. Housing dissatisfaction is determined by quality index, school quality, municipal service quality, taxes, and rent. Personal dissatisfaction is determined by the employment status of the population units involved, in addition to the amount of time which they are not able to spend in an activity which it was allocated for (i.e., involuntary time). These population units who have the highest dissatisfaction index will be the most likely to migrate.

C. Migration

Migration is a phenomenon inherent to all urban areas. People are continually moving within, into or out of a city. In CITY III population units may migrate in three ways: internally, out of the system, and into the system. Migration is calculated by the computer based upon local conditions reflecting the actions of the players.

The computer will pick a certain percentage of the local population units with the highest total dissatisfaction indices and select these population units to migrate. In addition, the computer will randomly select 7% of the High, 5% of the Middle, and 1% of the Low income population units from the local system to move, regardless of their dissatisfaction indices.

1. Internal Migration

Each of these population units which has been chosen to migrate looks for vacant housing within the city with a lower housing dissatisfaction index than the housing vacated. If the population unit can find one or several residences with a lower housing dissatisfaction index, it moves into the residence which has the lowest housing dissatisfaction index.

2. Out-Migration

In each round there will be certain number of migrating population units unable to find better housing. This group generally comes from the population units selected at random by the computer from the city's population as a whole. Population units which are unable to find better housing will out-migrate, leaving the city for the outside system.

3. In-Migration

In each round population units move into the simulated urban system. These people are called in-migrants. The total number of in-migrants will average 5% of the total local population plus or minus the effect of the attractive or repulsive qualities of the system as a whole. The computer moves people into the system on the basis of the attractiveness of the area as measured by the relative salary, available housing, job openings, overall school and municipal services conditions and tax rates.

Migration is a real factor in any city. If people can afford it, they are apt to move away from poorly maintained housing in bad neighborhoods which may be tying them to second-rate jobs. By the same token, there is a certain percentage of any population which will grow tired of a particular location and leave for no apparent reason. There will also be people from other areas who have found jobs in the city who will move into the system. These are the migratory patterns that CITY III takes into account.

The players can exercise only indirect control over migration by minimizing the causes of dissatisfaction and increasing the attractive features of the city as a whole or particular neighborhoods. A player must always remember that migration is mostly a response to player decisions in all sectors.

D. Types of Decisions

There are various types of decisions which a social decision-maker can make for the population units which he represents. These decisions include voting, boycotting, allocating time, and setting the dollar value of time spent travelling to and from work.

1. Voting

Social decision-makers vote on behalf of those population units they represent in a particular jurisdiction. All elections of Chairman and Councilmen or votes on referenda are decided by a popular majority.

The number of votes which can be cast by a social decision-maker is determined by the number of registered voters which he controls.

In terms of determining the course of action in the city, voting is an important instrument. Politicians, if they expect to be elected, must have the support of a number of social decision-makers representing at least a popular majority. Support can be gained in many ways. Candidates can be bound to certain principles and programs before a social decision-maker will throw his votes behind a candidate. This represents the political process in the CITY III with all the coalitions, factions, and political trade-offs also found in a real city.

2. Boycotting ($BYCT)

The boycott or strike is the second tool which a social decision-maker has at his disposal. A social decision-maker can direct the population units of any class under his control to strike a place of work (HI, LI, NS, CI, BG, BS, PG, PS, MS, SC, RAIL, and BUS) and/or boycott the places where they shop (PG, PS), and/or boycott a mode of public transportation (BUS and RAIL).

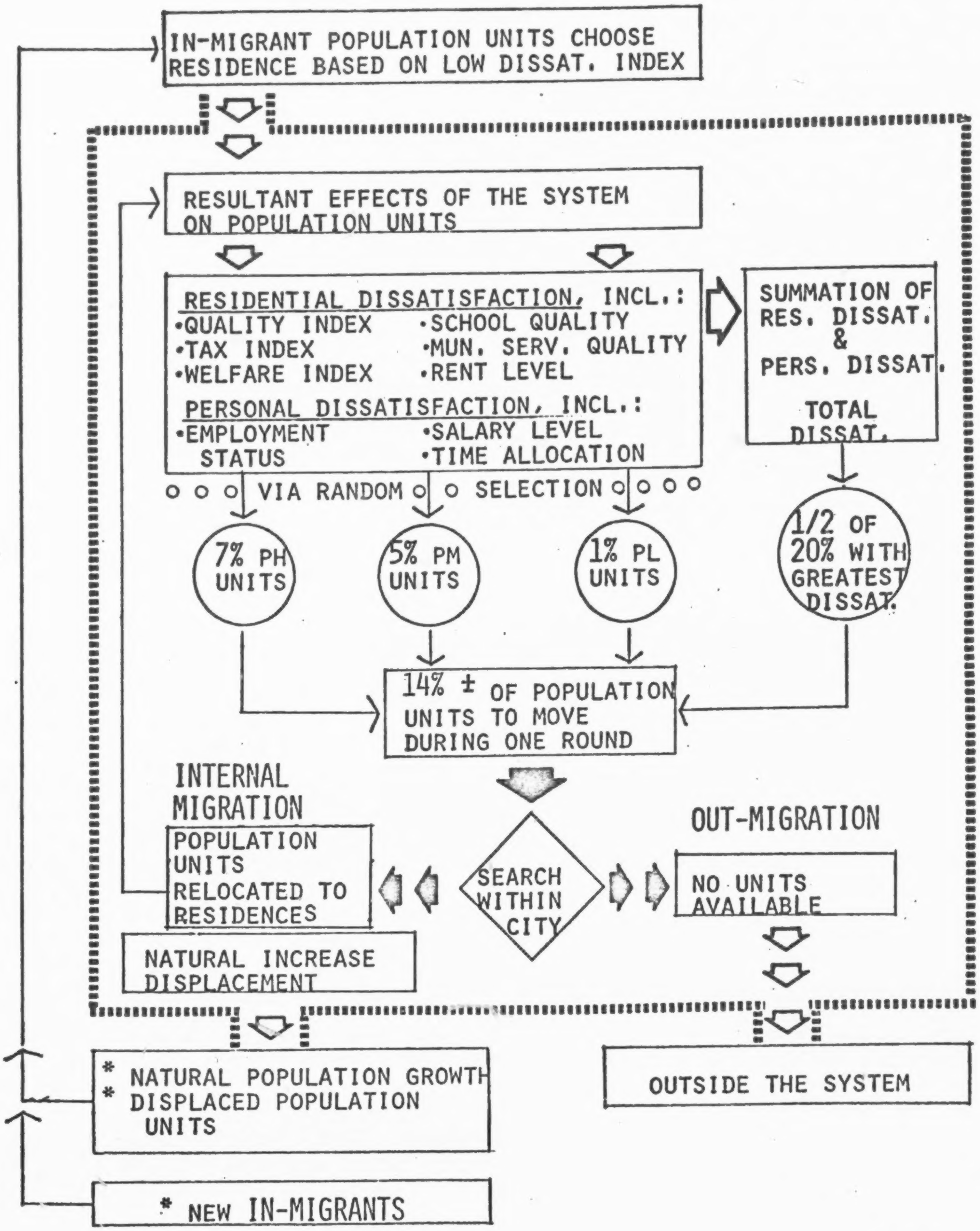
If a social decision-maker boycotts or strikes a particular work or shop location, the computer, through the commercial and employment processes will not assign those population units to work or shop at the specified parcel. Social decision-makers can increase the effectiveness of their boycott or strike by combining their boycotts. In such a manner, pressure groups can have a significant effect on the decisions and actions of employers and commercial establishments.

3. Time Allocation ($TIME)

Social decision-makers are able to allocate the leisure time for population units in each jurisdiction of the simulated metropolitan area. There are no hours or minutes in CITY III. Rather, time is simulated in terms of units. There are 100 units of leisure time available to workers in each population unit. However, this leisure time is decreased by the amount of time which it takes workers to travel to and from their place of employment. Therefore, the actual amount of time which can be allocated by social decision-makers is 100 units minus time spent travelling to and from work.

The number of time units consumed in travelling to and from work varies according to road types, transportation modes, and congestion, and distance travelled. The table below shows the amount of time units consumed according to various modes of transportation (on uncongested roads).

MIGRATION CYCLE


IN-MIGRANT POPULATION UNITS CHOOSE RESIDENCE BASED ON LOW DISSAT. INDEX
RESULTANT EFFECTS OF THE SYSTEM ON POPULATION UNITS
RESIDENTIAL DISSATISFACTION, INCL.:
•QUALITY INDEX
•TAX INDEX
•WELFARE INDEX
•SCHOOL QUALITY
•MUN. SERV. QUALITY
•RENT LEVEL
PERSONAL DISSATISFACTION, INCL.:
•EMPLOYMENT STATUS
•SALARY LEVEL
•TIME ALLOCATION
SUMMATION OF RES. DISSAT. & PERS. DISSAT.
TOTAL DISSAT.
VIA RANDOM SELECTION
7% PH UNITS
5% PM UNITS
1% PL UNITS
1/2 OF 20% WITH GREATEST DISSAT.
14% ± OF POPULATION UNITS TO MOVE DURING ONE ROUND
INTERNAL MIGRATION
POPULATION UNITS RELOCATED TO RESIDENCES
SEARCH WITHIN CITY
OUT-MIGRATION
NO UNITS AVAILABLE
NATURAL INCREASE DISPLACEMENT
* NATURAL POPULATION GROWTH
* DISPLACED POPULATION UNITS
OUTSIDE THE SYSTEM
* NEW IN-MIGRANTS

Time Consumption For Travel To and From Work

	On HY1	On HY2	On HY3	Waiting
Automobile (units/mi.)	3	2	1	0
				Waiting
Bus (units/mi.)	4	3	2	1
	Rail	Rail	Rail	Waiting
Rapid Rail (units/mi.)	1	1	1	1

Walk (a journey to work at an adjoining parcel) requires 1 time unit.

Highway congestion affects travel by automobile to work only. The degree to which congestion increases the time spent traveling to work is in direct proportion to the amount of congestion which occurs. For example, if a road is overcrowded by 20%, it will take a Pl 20% longer to travel on it.*

a. Extra Work

Extra work is part-time work. Social decision-makers specify time units for workers to spend in extra work. Extra employment is offered in two areas: teachers in adult education and certain part-time positions offered by other employers in the economic sectors. A full-time job is equivalent to 80 time units. Therefore, a half-time job is equivalent to 40 time units. Workers are paid in proportion to the percentage of a full-time job they fill. If they fill half of a full-time job, they are paid half the salary of a full-time worker in the particular income class. The salary per time unit in extra work is determined by dividing the typical salary of a population unit by 80 time units (the equivalent of a full-time job).

For example, suppose you have allocated 30 units of time to a PH for extra work. The typical salary for a PH is 1.2 million. The salary per time unit in extra work ($1.2m/80) is therefore $15,000. Finally, the total salary earned for that PH for working 30 time units extra is $450,000 (30 x $15,000). This information is summarized in the following table.

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*Bus congestion (in terms of the number of Pl's on the bus when it arrives at an intersection where a Pl is waiting) affects a Pl's waiting time in direct proportion to the amount of overcrowding.

Time Allocation - Part-time Employment

	PH	PM	PL
Units of time for full-time job	80	80	80
Typical salary per time unit*	$15,000	$10,000	$6,450

When allocating time to part-time employment, social decision-makers should make sure that such employment is available. If it is not, the time which would have been spent in part-time jobs will become involuntary time. Involuntary time contributes to personal dissatisfaction.

b. Education

Social sector decision-makers may also allocate time to be spent in education. In CITY III, each population unit has an educational level. The range of an educational level for a population unit is determined by its socio-economic class.

Educational Level

	PH	PM	PL
Minimum	70	40	0
Maximum	99	69	39

Since the educational level of a population unit will affect the ability of that unit to become employed in better jobs, it is the option of social decision-makers whether or not to attempt to maintain educational levels at their present value, increase them, or let them decrease each round by a factor of 10% of the difference between the current level and the minimum level for the population unit of that class. In order to compensate for this decrease in educational level and maintain a maximum level, a population unit should spend time in adult education each round.

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*Typical salary per time unit = $\frac{\text{Typical Salary to Pl}}{80}$

The amount of time which must be allocated to maintain a certain education level is summarized below:

Education Level	Number of Time Units Required to Maintain Education Level		
	PH	PM	PL
0	-	-	0
10	-	-	7
20	-	-	13
30	-	-	20
39	-	-	$\boxed{27}$
50	-	7	-
60	-	13	-
69	-	$\boxed{20}$	-
80	9	-	-
90	18	-	-
99	$\boxed{26}$	-	-

There are two types of adult education in CITY III, public and private. Adult education can be obtained for free only if the government sector supplies it. In a situation when time is allocated for free education and there is not enough available, the computer will total the demand with the supply and allocate time units equally on the basis of the demand-supply ratio. Social decision-makers may not allocate time in free education to high income population units. The characteristics of time allocation for adult education are summarized below.

Time Allocation:	Adult Education		
	PL	PM	PH
Educational Range	0-39	40-69	70-99
Annual time units required to Maintain Maximum educational level	27	20	26
Cost per unit (private) Per Pl	$3,000	$3,000	$3,000

When allocating time to public adult education, social decision-makers should make sure that the School Department is supplying it. If not, the time which would have been spent in education will become involuntary time. Involuntary time contributes to personal dissatisfaction.

c. Politics

Workers can also spend up to 60 units of leisure time in politics. Time spent in politics will increase the political power of a population unit by increasing its voter registration in a given round. The relationship between time spent in politics and increased voter registration is described below.

	PH	PM	PL
Units of time for 7% increase* in voters registered	10	10	10
Units of time for 10% increase in voters registered	50	50	50
Units of time for 15% increase in voters registered	60	60	60

*refers to increase above normal voter registration per income class of population units. Any increase is for one round only.

d. Recreation

Leisure time can also be spent in recreation. Population units who spend time in recreation must buy from PG and PS. The units of PG and PS required per time unit in recreation are given below:

Time Allocation - Recreation

	PH	PM	PL
Units of PG per unit of time in recreation	.1	.05	.025
Units of PS per unit of time in recreation	.075	.05	0

The most important thing to remember about time allocation is that it is a kind of debit-credit operation. You start with 100 units of time to assign for population units of each class for each jurisdiction. You may estimate that 15 units of time are going to be consumed in traveling to and from work for your PL units; you have only 85 units of time left. In studying the computer output for your PL units, you may discover that they are not receiving enough income, so you allocate 40 units to extra work. Further, the educational level of these PL's is extremely low, so you allocate 25 units for adult education. You now have only 20 units left for politics and recreation. Suppose you split them evenly between these two activities. You then may discover that you guessed wrong when estimating time consumed in traveling to and from work. Because of congestion and an inefficient Highway Department, it takes 30 units of time rather than 15. You allocated 15 units of time too few for travel to and from work and 15 units too many for other activities. Since these are arranged in order of priority, the computer will require these 15 units for transportation from recreation first and then politics. Your PL units will end up spending no time in recreation and only 5 units of time in politics. The result will be that the high-income classes will have a higher rate of registration and hence a greater political voice.

These are just some of the problems with which you will be faced. Remember that you are controlling people represented in units of 500 persons each. Time allocation is a powerful instrument that can greatly affect the balance of social problems and hence the economic and governmental decisions within the simulated city.

4. Setting the Dollar Value of Time ($VALUE)

The computer assigns all population units to modes of transportation to and from work on the basis of least cost. Least cost includes transportation charges per mile (which differ according to mode of transportation, type of road and amount of congestion) as well as the dollar value of time spent traveling. The social decision-maker is able to indicate the dollar value of one time unit consumed traveling to and from work for each of the classes which he represents. The typical dollar values of a time unit spent traveling to and from work are $25 (PL), $50 (PM), $100 (PH).* As the dollar value of a time unit spent traveling increases, the chances are that the computer will assign a more expensive but quicker mode of transportation to work (i.e., via automobile in almost all cases).

*These values assume typical salaries of $2500 per PL worker, $5000 per PM worker, and $10,000 per PH worker.

The following example will demonstrate how the computer considers the dollar value of time.

Let us say the transportation costs for one worker are $150 per year to get to work by bus and $320 to get to work by auto. It also requires an extra 4 time units to travel by bus instead of auto.

If the dollar value of time for that population unit was set at $40, it would cost them $150 plus 4 time units times $40 (dollar value) or $310 to get to work by bus. To take auto it costs $320 (no extra time units consumed). Therefore, the computer would assign the population unit the BUS mode to travel to work (i.e., $310 is less than $320).

In the same case, suppose the dollar value of time was set to $50. Then the total bus cost would be $150 plus 4 time units times $50 (dollar value) or $350. Auto would cost only $320. Therefore, the computer would assign these population units the auto mode to work (i.e., $320 is less than $350).

IV. THE GOVERNMENT SECTOR

Players in the Government Sector of CITY III are the public officials of the simulated city. They make public policy, provide public services and raise and disperse funds. Essentially, the Government Sector consists of two components: the elected officials from each jurisdiction (Chairman and Councilmen) and the appointed officials who represent the bureaucracy. The bureaucracy includes at least five departments: Assessment, Schools, Municipal Services, Highway, and Planning and Zoning. It may also include a Utility Department, a Bus Company and a Railroad Company, though these operations can be privately owned and operated.

A. The Chairman and Council (CH)

There is one Chairman and at least one Councilman from each political jurisdiction in CITY are elected at the beginning of each round by the social decision-makers who cast votes for the population units which they represent. The Chairman and Councilmen have control over the following aspects of governmental decision-making: appointments, budgets, taxes, subsidies and welfare. The extent to which they share this power is an option which is open to the players themselves. Whether they want to govern informally, or formally, accept bribes or extort with government funds is subject to their own judgment. They must remember, however, that they are responsible to the people and that their behavior will be judged at the next election.

The Chairman and Councilmen must appoint players to serve as decision-makers in the bureaucratic departments. These appointments may be made on the basis of any criteria. Nevertheless, it must be noted that the representatives of each department will be responsible to the Chairman and Councilmen. The greater extent to which these departments are willing to cooperate with the elected representatives of the people, the greater are the chances that they will get the funds they need to operate their departments and therefore provide quality services to the public.

B. Chairman Decisions

The Chairman of the city can make any or all of the following decisions during a given round: appropriate funds, distribute subsidies, change tax rates, set welfare payments, and float bonds. The Chairman has a current account only; all tax revenues and expenditures are through that account. Any unspent department funds remain in the department's treasury; they do not revert to the Chairman's account.

1. Appropriate Funds ($CASH)

The Chairman and Council in every jurisdiction are responsible for formulating the budget for the operation of the government departments. Basically, the budgetary process involves the allocation of appropriations to the various departments. Departments which receive appropriations to the various departments. Departments which receive appropriations are: Schools, Municipal Services, Highways, and Planning and Zoning. The Utility Department, Bus and Rail Companies receive income from user charges and fares; therefore, they do not receive direct appropriations. There is no formal manner in which players representing the various departments are expected to file appropriations requests with the Chairman.

The Chairman must be sure to indicate whether he is appropriating money to the capital or current account of a given department or both. For example, when appropriating money for purpose of constructing new facilities or purchasing land, that money must go to a capital account. On the other hand, funds for the normal operation or maintenance of a department should be appropriated to the current account of that department. All appropriations will automatically continue at previous rates unless an input change is issued in subsequent rounds.

2. Distribute Subsidies ($CASH)

Subsidies may be given to the Utility Department, the Bus Company, the Rail Company, or to any economic decision-maker. It is only necessary to specify the account (capital or current) to which the money is being subsidized. A subsidy is granted for one round only, unlike an appropriation.

3. Transfer Cash ($CASH)

The Chairman may transfer cash to any government department or to an economic decision-maker. A cash transfer shows up in the receiver's account as "miscellaneous" income or revenue. Like a subsidy, a cash transfer occurs only for one round. Cash transfer is the only method by which the Chairman can grant funds to a department in another jurisdiction.

4. Set Tax Rates ($TAXES)

Taxes constitute the chief source of revenue for the operation of the urban government in CITY III. There are four types of local taxes in CITY III: Property, income, automobile, and sales. The Chairman may specify the rate at which these taxes are to be levied and the computer will automatically collect the tax revenue. If the Chairman does not set tax rates for a given round, the computer will collect taxes at the previous rate. The methods by which the taxes are calculated by the computer differ for each type of tax.

a. Property Taxes

There are two types of property taxes: land and developments. Land tax is applied to all privately owned land. The tax paid is determined by multiplying the percent of a parcel privately owned times the assessed value of the parcel (set by the assessment department) times land tax rate. Development tax is applied to the economic land use on a given parcel. The tax payment is determined by multiplying the assessed value of development of a parcel times development tax rate.

b. Personal Income Taxes

A political jurisdiction may tax the personal income of either the people who live there or the people who work there. A resident income tax is paid by a population unit and is determined by multiplying the resident income tax rate times gross wages of people who live in a jurisdiction.

Employee income tax is determined by multiplying the employee income tax rate times gross income of the people who work in the jurisdiction.

c. Automobile Taxes

Automobile taxes are also levied by a particular jurisdiction on the people who live there and the people who work there. Automobile resident tax is determined by multiplying the automobile resident tax rate times the travel cost to work by automobile of the people who live in the jurisdiction. Automobile employee tax is determined by multiplying the automobile employee tax rate times the travel cost to work of the people who work in the jurisdiction.

d. Sales Taxes

Sales taxes are levied on all purchasers of business goods and business services and personal goods and personal services. There are separate tax rates for goods and services. The tax is determined by multiplying the sales tax rate on goods/services in the jurisdiction in which the seller is located times the amount of purchase of goods/services at each seller.

5. Set Welfare Payments ($OTHER)

Welfare payments are the equivalent of subsidies to the social sector. The Chairman may set the welfare payment per unemployed worker. The payments are distributed from the current account of the municipal services department and the Chairman should appropriate the necessary funds for these payments to the current account of that department.

Current federal-state aid is available to the municipal services department for welfare payments. It is granted automatically (by the computer) on the basis of two federal-state dollars for each local dollar up to a maximum equivalent to $35 per resident of the jurisdiction.

6. Float Bonds ($OTHER)

Bonds can be defined as loans to the government sector and are an additional source of revenue in CITY III. There are two types of bonds available: current and capital. Current bonds are automatically floated by the computer when a department's expenditures exceed its revenues. If the Chairman grants more in appropriations, subsidies and miscellaneous expenditures than he receives in tax revenues, the computer floats a current bond for the Chairman regardless of whether the departments actually spent the money.

A current bond has a term of two rounds and its payments are automatically deducted from the finances of the department or the Chairman in equal installments beginning in the round after the bond is floated. Capital bonds are available to the various departments to finance capital projects. A capital bond has a term of 25 rounds and must be floated by the Chairman. Interest rates on all bonds are determined by the Outside System (the computer). No department may have more than 22 bonds outstanding at one time. All bond payments are made through current accounts (except Planning and Zoning, which has only a capital account).

Further, the total allowable government debt is 15% of the total assessed value of all land and buildings in the jurisdiction. The debt limit for the various departments is 20% (Schools, Highways, Chairman, Utilities), 15% (Municipal Services) and 5% (Planning and Zoning) of the total allowable government debt.

The Bus Company has a total allowable debt of 3% of the total assessed value of all land and buildings on the board and the Rail Company has a total allowable debt of 5% of the total assessed value of land and buildings on the board.

C. The Bureaucracy

1. Common Characteristics

All government departments (except Assessment and Planning and Zoning) share certain characteristics with economic sector land uses. These characteristics are:

a. Development Level - indicates the size of a development. Development level ranges from 1 to 3 for all government land uses. Development level is also a multiplier which affects land requirements, capacity, employment, etc. (i.e., an SC1 requires 16% of a square mile and an SC2 requires 32% of a square mile).

b. Land Requirements - the amount of land required for a building of the first level of development.

c. Value Ratio - the ratio of present value of a development to its original value, times 100. Value ratio ranges from 0 to 100 and indicates the physical condition of a development.

d. Depreciation - the rate at which a value ratio of a development declines each year. This rate is applied to the original value ratio of a development or equipment (i.e., 100).

e. Maintenance Level - the level at which the value ratio is to be maintained. Maintaining a development at a specific value ratio involves purchases of business goods (BG) and business services (BS) either from the Outside System or from local BG and BS establishments. The costs of maintenance are automatically deducted by the computer.

The common characteristics of the government land uses are summarized below:

Department	Development Level	Land Requirements	Value Ratio	Depreciation (per annum)	Maintenance Level
Schools (SC)	1-3	16%	0-100	2.0%	0-100
Highways (HY)	1-3	8% (HY1)* 12% (TM1)*	0-100	5.0Z**	0-100
Municipal Services (MS)	1-3	12%	0-100	3.3%	0-100
Utilities (UT)	1-3	20%	0-100	3.3%	0-100
Rapid Rail (RAIL)	1	4% surface tracks	0-100	3.5% (equipment)	0-100
Bus (BUS)	NA	none	0-100	3.5% (equipment)	0-100

2. Source of Income

Aside from appropriations and bonding (previously discussed), there are two other sources of revenue for most governmental departments. These sources are Federal-state aid and miscellaneous income.

Federal-state aid is available to Schools, Highways, and Planning and Zoning for capital expenses on federally-approved projects. School and highway aid is for construction at approved sites; Planning and Zoning is for purchases of parkland and is not restricted to specific locations. If capital aid is granted to Schools or Highways, it is in the form of a fixed ratio of aid to local funds spent. Current Federal-state aid is also available to the School and Municipal Services Departments. Aid, once granted, is available until spent, limited only to whatever location and level restrictions are imposed. This is explained in more detail in the descriptions of the specific departments.

All public departments may receive income from miscellaneous sources, such as the sale of land they own or cash transfers from other departments or decision-makers in other sectors. Sources of revenue such as this have great potential for varied uses. Cash transfers can often be a gift (or in more realistic terms, a bribe) to insure that a particular decision in the game goes a player's way.

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* HY2 requires 12% and HY3 requires 16%. TM2 requires 16% and TM3 requires 20%.

** Z is the actual use of a road segment divided by the effective capacity of a road segment.

The remainder of this section will deal with the individual departments and the specific characteristics relating to their operation.

D. Assessment Department

The Assessment Department for each jurisdiction makes decisions relating to the taxation of privately owned property (land and developments) represented in the model. This department has the opportunity to operate selectively on the property tax rates. Whereas the Chairman sets the tax rates for land and developments, the Assessment Department controls the assessment rates on all property.

1. Assessment Rate

The assessment rate is the rate at which land and developments are valued in relation to their real market values for tax purposes. For example, a land assessment rate of .50 means that the base to which the land tax is applied is one half (50 percent) of the market value of the land. The development assessment rate is applied to developments owned by economic decision-makers and the land assessment rate is applied only to the percent of privately owned land on a parcel owned by an economic decision-maker.

2. Market Value

a. Land

The market value of all owned land is printed on the Fair Market Value of Land Map. The market value of land will change for either of two reasons:

(1) After construction of a new development or an additional level of development on a parcel.

(2) After the purchase of a parcel by an economic decision-maker.
The model assumes that the market value of a parcel is always updated by the actual purchase price of a parcel when an economic decision-maker buys a parcel, as long as that price is not less than the previously existing market value.

The market value of unowned land (i.e., owned by the Outside System) is calculated -- but not printed until it is purchased -- on the basis of existing values of surrounding parcels and characteristics such as proximity to highways, terminals, employment, residences and the existence of utilities and zoning.

b. Developments

The market value of developments is determined by multiplying the New Development Value times development level* times value ratio/100. The New Development Values for the various land uses are given below:

Land Use	New Development Value
HI	$105,000,000
LI	60,000,000
NS	50,000,000
CI	120,000,000
BG	25,000,000
BS	10,000,000
PG	30,000,000
PS	10,000,000
RA	1,000,000
RB	6,000,000
RC	25,000,000

For example, an HI2 with a value ratio of 90 would have a market value of $105,000,000 times 2 times .90 or $189,000,000.

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*Development level indicates the size and capacity of a building. There are 3 possible development levels for all land uses except residences, which have eight.

Once a new development appears on a parcel, the market value of land increases as a function of the Ratio of Land Development Value. The minimum Ratio of Land/Development Value is summarized below for all economic land uses:

Land Use	New Development Value*	Minimum Ratio of Land/Development Value
HI	$105,000,000	30.0%
LI	60,000,000	30.0%
NS	50,000,000	30.0%
CI	120,000,000	30.0%
BG	25,000,000	25.0%
BS	10,000,000	25.0%
PG	30,000,000	25.0%
PS	10,000,000	25.0%
RA	1,000,000	20.0%
RB	6,000,000	10.0%
RC	25,000,000	5.0%

To determine the market value of land with a new development on it, the computer multiplies the New Development Value times the development level times the value ratio/100* times the Ratio of Land/Development Value.
For example, if an HI1 (value ratio = 100) is upgraded to an HI2 (value ratio = 100), the market value of land for the parcel would be $105,000,000 times 2 times 1 times .30 or $63,000,000.
There is one exception to this procedure. If the market value of the parcel as determined by the above method is not greater than the previous market value, the higher value will remain.

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*These figures assume a value ratio (or quality index for residences) of 100. Value ratio and quality index indicate the physical condition of a building. For example, a BG with a value ratio of 75 has depreciated by a factor of 25% of its original development value.

3. Assessed Value

The assessed value of land and developments is determined by multiplying the assessment rate (set by assessment department) times the market value of land or development. In the case of land, it must be remembered that the assessment rate is applied only to the market value of the portion of land which is privately owned. For example, suppose economic decision-maker A owns 88% of parcel 9228 and it has a market value of $500,000,000. The market value would be .88 times $500,000,000 or $440,000,000. If the assessment rate is .50, the assessed value of the privately owned land would be $220,000,000. The land tax rate (determined by Chairman) would then be multiplied by that figure to determine the amount of land tax to be paid.

E. Assessment Department Decisions

The Assessment Department may make any or all of the following decisions during a round of play:

1. Change Development Assessment Rates (D) for all Land Uses Jurisdiction-Wide.

2. Change Development Assessment Rates for particular land uses only (DHI, DLI, DNS, DCI, DBG, DBS, DPG, DPS, DRA, DRB, DRC). This means that certain developments will have different assessment rates from others.

3. Change Land Assessment Rates (L) for all privately owned parcels jurisdiction-wide.

4. Change Land Assessment Rates for parcels with particular land uses (LHI, LLI, LNS, LCI, LBG, LBS, LPG, LPS, LRA, LRB, LRC). This means that parcels with a particular land use on them may be assessed at a different rate from other parcels.

5. Define Special Zones. Different development assessment rates; development assessment rates for a particular land use; land assessment rates, or land assessment rates for parcels with a particular land use may be in effect in a special zone. Special zones are one or more parcels where any of these four assessment rates may be applied differently from the rest of the jurisdiction. Special zones are in effect for one round only, and if they are to remain in subsequent rounds, they must be redefined.

6. Make Special Assessments for individual parcels. In this case the Assessment Department may override the existing value and input its own assessed value for a particular parcel of land or a particular development.

When making decisions and coding them on the input decision form, the decision-maker representing the Assessment Department must be careful to observe a certain order. All jurisdiction-wide assessment decisions must be made first. After these decisions are made, special zones may be defined. The special rates which are to be in effect in a special zone must follow immediately after that particular zone is defined; otherwise, the computer will impose the same rates as have been previously specified on a jurisdiction-wide basis. Finally, only special assessments for a particular parcel may be made after special zone rates are specified. To summarize the order of assessment decisions:

1. Change assessment rates jurisdiction-wide.

2. Define special zones

3. Specify assessment rates for the special zone just defined.

4. Make special assessments.

All assessment decisions are in effect for one round only.

F. School Department (SC)

1. Employment and Capacity

The School Department hires teachers from the high (PH) and middle (PM) income population units only. There are 120 teachers in a PH and 160 teachers in a PM.

Schools have an optimal employment mix. This mix, however, does not determine output, but rather the number of students which a school can serve (i.e., design capacity).

This relationship is given below for an SC1:

Design Capacity (students) as a Function of Employment Mix

PM Units	0	1	2	3	4	5	6
PH Units							
0		2,520	4,140	6,840	9,900	12,240	13,140
1	3,600	5,910	8,460	11,200	13,320	15,300	17,100
2	7,200	9,900	12,600	15,500	17,460	19,440	21,240
3	10,800	14,040	16,920	20,000	21,960	23,760	25,560
4	13,140	17,460	21,060	23,400	25,200	27,000	28,620
5	17,100	20,700	23,400	26,640	28,440	30,000	31,500
6	19,800	23,850	26,820	29,880	31,320	32,850	34,200

The optimal employment mix of an SC1 is 3 PM teachers and 3 PH teachers. This mix creates a design capacity of 20,000 students. The per student cost (in salaries) of operating an SC1 is least at this mix. At any other employment mix the per student cost (in salaries) increases.*

The value ratio also affects capacity. For example, the design capacity of an SC1 with 2 PH teachers and 4 PM teachers is 17,460 students, but its effective capacity is determined by multiplying its design capacity times value ratio/100. Therefore, the effective capacity of the SC1 with a value ratio of 80 would be:

$$17460 \times \frac{80}{100} = 13{,}968 \text{ students.}$$

* Remember: Development levels indicate the size of a building and are multiples for other factors as well. For example, a SC2 with 6 PH teachers and 6 PM teachers has a design capacity of 40,000 students.

The use index of a school is determined by dividing its use by its effective capacity and multiplying the result by 100. If the use index is greater than 100, the school is overcrowded. Overcrowded schools contribute to dissatisfaction and thus to migration in the social sector.

2. School Assignments

Students are assigned to schools by the computer. Middle and high income families have certain criteria for the school in their district. If the school fails to meet these criteria, these students will be assigned by the computer to private schools at the expense of the population unit they represent. For high income students the school must have (1) a student/teacher ratio of at least one teacher per 18 students, (2) a value ratio above 80, and (3) at least 1 PH teacher unit for every PM teacher unit. Middle income students will not attend public school unless there is (1) a student/teacher ratio no greater than 21-1 (2) a value ratio of 60 and (3) at least 3 PH teacher units to every 4 PM teacher units. Students of the low socio-economic class go to the public school in their district regardless of the high and middle class criteria, unless their residence location is excluded from a district. The costs of private education are $37,500 per PH (130 students), $25,000 per PM (140 students), and $12,500 per PL (100 students).

3. Adult Education

The School Department can offer courses in adult education on a jurisdiction-wide basis. Thus, adult education is not tied to a particular location or school. The number of population units hired from the PH and PM classes on part-time basis determines the capacity of the adult education program to serve population units who allocate time for free adult education.

All adult education teachers are part-time workers. The department indicates the number of time units to be hired from the high and/or middle population classes. One part-time employment unit of middle income teachers supplies one adult teacher unit while one part-time employment unit of high income teachers supplies one-and-one-half adult teacher units. One adult teacher unit provides 10 units of adult education. Adult education teachers are paid the same way all part-time workers are paid -- on a percent basis of the full-time job they fill. (see Social Sector: Time Allocation).

The requirements for part-time education are summarized on the following page.

Teachers	Typical Cost of One Part-Time Teacher Unit	Units of Adult Education Per Part-Time Teacher Unit
PH	$15,000	15
PM	$10,000	10

4. Revenues

The School Department receives revenue to its current and capital accounts from various sources. These include:

a. Appropriations. These are funds distributed to the current and/or capital account of the department by the chairman.

b. Federal State Aid. Current federal state aid is automatically granted to the department in the amount of $225 for each student enrolled in public schools in the jurisdiction. Capital federal-state aid may be applied to the construction of new schools.

c. Bonds. Current bonds are automatically floated by the computer if the current expenditures of the department exceed its current revenue. Current bonds have a duration of two years and the interest rate is set by the computer. Capital bonds may be floated for a department by the Chairman, subject to a referendum by the social sector. Capital bonds have a duration of 25 years and interest rate is set by the computer.

d. Miscellaneous. These revenues include such items as cash transfers to the capital or current accounts of the department and income from the sale of land (capital account only).

5. Expenditures

The School Department spends money on the following items:

a. Goods and Services. The School Department must purchase business goods (BG) and business services (BS) for the normal operation of its schools and for the maintenance and/or renovation of its schools. BG and BS may be purchased either from establishments owned by local economic decision-makers (competitive prices usually range around $100,000 per unit) or from the Outside System (i.e., the computer) at fixed prices of $130,000 per unit. Goods and services are purchased locally only if contracts are made.

The goods and services requirements of a level one school (SC1) are outlined below:

	BG	BS
For 1% Renovation and/or Maintenance	2 units	.7 units
For Normal Operation of an SC1	8 units	3 units

b. Full-Time Salaries. The typical salary for a PH worker is $10,000, and the typical salary for a PM worker is $5,000. There are 120 workers (teachers) in a PH and 160 workers (teachers) in a PM.

c. Miscellaneous. These expenditures include cash transfers from the capital or current accounts of the department to an economic or government decision-maker, or from one account to another account.

d. Bond Payments. These include payments on interest and principal of outstanding capital bonds and current bonds floated by the department.

e. Adult Education. These are salaries for part-time workers for adult education. One PH part-time teacher unit costs $15,000 and supplies 15 units of adult education. One PM part-time teacher unit costs $10,000 and supplies 10 units of adult education.

f. School Construction. This includes funds expended for the construction of a new school, the upgrading of an old one, or the demolition of a school. The "typical" cost of an SC1 is $27,000,000. If a local construction industry (CI) does not offer a fair price, a school can be constructed by the Outside System at a fixed cost of $35,100,000. The "typical" demolition cost for an SC1 is $5,400,000. The fixed demolition cost (Outside System) is $7,020,000.

g. Land Purchase. This includes expenditures for the purchase of land from government or economic decision-makers or the Outside System.

G. School Department Decisions

The School Department is responsible for providing educational facilities to the residents of the simulated area. In order to accomplish this, the School Department may make any or all of the following decisions: purchase land, change employment, change maintenance level, make contracts for BG and BS purchases, change district boundaries, transfer cash, change salaries, build schools, request federal-state aid, and provide adult education.

1. Purchase Land ($PU)

The School Department may purchase land from either of two sources: another decision-maker who owns the parcel or the Outside System (i.e., the computer).

When purchasing land from another decision-maker the department must buy undeveloped land in portions of 4% of a square mile (i.e., 4, 6, 12, 16, ... 92, 96, 100%) and the terms of the purchase are arrived at by mutual agreement. When bidding on land owned by the computer, the department must also purchase lots in portions of 4%. The bidding price may be determined from the Fair Market Value Map or from other sources at the disposal of the department.

2. Change Employment ($CVPT)

The School Department has an employment mix which describes its capacity of students. Further, the ratio of PH to PM teachers affects what classes of students will attend a particular school. The School Department can request a different employment mix at any school and if there are PH and PM workers available and fair salaries are offered, the computer will assign new teachers to that school.

3. Change Maintenance Level ($CVPT)

Each school has a value ratio which describes the quality of the building, affects capacity, and determines the type of students who will attend that school. School buildings depreciate at a constant rate of 2% per round. Decision-makers in the School Department can counter the effects of depreciation (i.e., a declining value ratio) by specifying a maintenance level at which the value ratio of a school is to be maintained. Maintenance and/or renovation (i.e., raising the maintenance level above value ratio) involves purchases of business goods and business services either from local BG and BS establishments or from the Outside System.

4. Award Contracts ($CVPT)

The School Department purchases business goods (BG) and business services (BS) for the maintenance and normal operation of each of its schools. The department may contract to buy from local BG and BS establishments owned by economic decision-makers (competitive prices usually range around $100,000 per unit), or it will automatically buy from the Outside System at $130,000 per unit of BG or BS.

5. Change District Boundaries ($REDIST)

Each school serves a school district and there must be only one school per district. The original districts are printed on first round computer maps. The decision-maker representing the School Department may alter district boundaries at any time. This allows him to do such things as relieve overcrowding in one district if there is an under-crowded school in an adjacent district. Two districts may not overlap (i.e., serve same parcel), nor can they be discontinuous. The parcel on which a school is located is automatically in its district.

6. Transfer Cash ($CASH)

The School Department may transfer cash between its own capital or current accounts, to the capital or current accounts of other departments or to the Chairman, or to an economic decision-maker.

7. Change Salaries ($OTHER)

The School Department is in competition with establishments in the economic sector for PH and PM workers to fill teaching positions. The typical salary for a PH worker is $10,000, and the typical salary for a PM worker is $5,000. The School Department may change salaries at any time, but when doing so, the changes go into effect for all teachers and not just those at a given school.

8. Build Schools ($BUILD or $OUBLD)

The School Department may build new schools, upgrade (i.e., add an additional level of development), or demolish old ones. Construction may be accomplished either by the local CI or by the Outside System at 1.3 times the typical cost. The typical construction cost of an SC1 is $27,000,000 and the demolition cost is $5,400,000 by a CI. Schools may be located on any parcel, but only one school can be on a parcel. All construction requires one full round to complete. An SC1 requires 16% of a square mile.

9. Request Federal-State Aid ($FSA)

Schools are eligible for two types of Federal-state aid: current and capital. The School Department automatically receives aid for current expenditures in the amount of $225 for each student enrolled in the system.

Decision-makers must request Federal-state aid for capital expenditures (i.e., the construction of new facilities). If granted, it must be matched dollar for dollar by local funds. Aid for construction and upgrading on a maximum of 3 schools, if the city is under 1,000,000 in population, and for two more schools for each additional million of population in the city may be requested each round. If aid is approved for a construction site, the aid is available for only that location and only up to the approved development level. There is a 60% chance of acceptance of the first request if the ratio of students per school (first level of development) is about 18,000/1. The chances increase slightly as the ratio increases. The second request has a 40% chance of acceptance, which varies with the same criteria. All other requests have a 30% chance. Aid should be requested one round before construction is intended.

10. Request Teachers for Adult Education ($OTHER)

The School Department can provide adult education by specifying the number of high and middle income units in adult education requested. These units will be provided if sufficient part-time teachers are available.

H. Municipal Services Department (MS)

The function of the Municipal Services Department is to provide the equivalent of fire, police and sanitary service to the simulated area. This service is expressed in terms of MS units.

1. Employment and Capacity

The Municipal Services Department employs from the middle (PM) and low (PL) income population units only. There are 160 workers in a PM and 200 workers in a PL unit. Like schools, the design capacity of an MS plant is determined by its employment mix. This relationship is summarized on the following page for a level one plant (MS1):

Design Capacity (MS units) as a Function of Employment Mix

PL Worker Units	0	1	2	3	4	5	6
PM Worker Units							
0		140	230	380	500	680	730
1	200	330	470	620	740	850	950
2	400	550	700	860	970	1,080	1,180
3	600	780	940	1,100	1,220	1,320	1,420
4	730	970	1,170	1,300	1,400	1,500	1,590
5	950	1,150	1,300	1,480	1,580	1,670	1,750
6	1,100	1,325	1,490	1,660	1,740	1,825	1,900

The optimal employment mix of an MS1 is 3 PM workers and 3 PL workers. This mix creates a design capacity of 1,100 MS units. The per unit cost (in salaries) of operating an MS1 is least at this mix. At any other employment mix, the per unit cost (in salaries) increases.*

Value ratio also affects the capacity of an MS plant. For example, an MS1 with 4 PL workers and 2 PM workers has a design capacity of 970 MS units. The effective capacity of an MS plant is determined by multiplying its design capacity times the value ratio/100. Suppose that the value ratio was 80, the effective capacity would be:

$$970 \times \frac{80}{100} = 776 \text{ MS units}$$

2. Drain on Municipal Services

As in a real city, all private developments require municipal services. The drain (or "loading") of MS units by the various land uses at the first level of development is summarized on the next page:

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*Remember: Development levels indicate the size of a building and are multiples for other factors as well. For example, an MS2 with 6 PM workers and 6 PL workers has a design capacity of 2,200 MS units.

Land Use	Drain (MS Units)
HI1	105
LI1	65
NS1	50
BG1	25
BS1	10
PG1	30
PS1	10
RA1	10
RB1	60
RC1	250

The quality of MS service affects depreciation of economic land uses and social sector dissatisfaction. Quality of service deteriorates when an MS plant is drained of more units of service than its effective capacity. The factor by which land uses served by an MS plant depreciate is expressed in terms of the MS Use Index.

$$\text{MS Use Index} = \frac{\text{Actual Number of MS Units Drained}}{\text{Effective Capacity of MS Plant}} \times 100$$

[Note: An MS Use Index will never be computed above 200.]

In other words, an MS plant with a Use Index greater than 100 is being overused and depreciation and dissatisfaction will be increased.

3. Revenues

The Municipal Services Department receives income for its current and capital accounts from various sources. These include:

a. Appropriations. These are funds distributed to the current and/or capital accounts of the department by the Chairman.

b. Federal-State Aid. Current federal-state aid is automatically granted to the department for welfare payments. Aid is granted on the basis of 2 federal-state dollars for each local dollar up to a maximum equivalent to $35 per resident of a jurisdiction. The Municipal Services Department is not eligible for capital federal-state aid.

c. Miscellaneous. This income includes such items as cash transfers to the capital or current account of the department and income from the sale of land (capital account only).

d. Bonds. Current bonds are automatically floated by the computer if the current expenditures of the department exceed its current revenue. Current bonds have a duration of two years and the interest rate is set by the computer. Capital bonds may be floated for a department by the chairman, subject to a referendum by the social sector. Capital bonds have a duration of 25 years and the interest rate is set by the computer.

4. Expenditures

The Municipal Services Department spends money in the following items:

a. Welfare Payments. Welfare payments for unemployed workers are specified by the Chairman but distributed from the current accounts of the Municipal Services Department.

b. Goods and Services. The Municipal Services Department must purchase business goods (BG) and business services (BS) for the normal operation of its plants and for the maintenance and/or renovation of its plants. BG and BS may be purchased from either local establishments owned by economic decision-makers (competitive prices usually range around $100,000 per unit)or from the Outside System (i.e., the computer) at fixed prices of $130,000 per unit. Contracts must be made if purchases are to be from local establishments.

The goods and services requirements of a level one plant (MS1) are outlined below:

	BG	BS
For 1% Renovation and/or Maintenance	2 units	1 unit
For Normal Operation of an MS1	7 units	3 units

c. Miscellaneous. These expenditures include cash transfers from the capital or current accounts of the department to another government or economic decision-maker, or from one account to another account.

d. Salaries. The typical salary for one PM worker is $5,000, and the typical salary for one PL worker is $2,500. There are 160 workers in a PM and 200 workers in a PL unit.

e. Bond Payments. These include payments on interest and principal of outstanding capital and current bonds floated by the department.

f. Construction. This includes funds expended for the construction of a new MS plant or the demolition of an old one. The "typical" cost of an MS1 is $30,000,000. If a local construction industry (CI) does not offer a fair price, an MS plant can be constructed by the Outside System at a fixed cost of $39,000,000. The "typical" local demolition cost is $6,000,000 and the fixed demolition cost (Outside System) is $7,800,000.

g. Land Purchase. This includes expenditures for the purchase of land either from a government or economic decision-maker or from the Outside System.

I. Municipal Services Decisions

In order to provide adequate services to the city, the Municipal Services Department may make any or all of the following decisions during a round of play: purchase land, change employment, change maintenance level, make contracts for BG and BS purchases, change district boundaries, transfer cash, change salaries, build, upgrade or demolish MS plants.

1. Purchase Land ($PU)

The Municipal Services Department may purchase land from either of two sources: another decision-maker who owns land or the Outside System (i.e., the computer). When purchasing land from another decision-maker, the department must buy undeveloped land in portions of 4% of a square mile (i.e., 4, 8, 12, 16 ..... 92, 96, 100%) and the terms of the purchase are arrived at by mutual agreement. When bidding on land owned by the Outside System, the department must also purchase lots in portions of 4%. The bidding price may be determined from the Auction Asking Price Map.

2. Change Employment ($CVPT)

Like the School Department, the Municipal Services Department has an employment mix which describes its capacity to produce MS service (i.e., MS units) to the community. The Municipal Services Department can request a different employment mix at any MS plant, and if there are PM and PL workers available and adequate salaries are offered, the computer will assign new workers to that plant.

3. Change Maintenance Level ($CVPT)

Each MS plant has a value ratio which describes the quality of the building and affects the ability of that plant to produce at its design capacity. MS plants depreciate at a constant rate of 3.3% per round. Decision-makers in the Municipal Services Department can counter the natural effects of depreciation (i.e., a declining value ratio) by specifying a maintenance level at which the value ratio of an MS plant is to be maintained. Maintenance and/or renovation (i.e., raising the maintenance level above the value ratio) involves purchases of business goods and business services either from local BG and BS establishments or from the Outside System.

4. Award Contracts ($CVPT)

The Municipal Services Department purchases business goods (BG) and business services (BS) for the maintenance and normal operation of each of its plants. BG and BS may be purchased either from local BG and BS establishments as the result of a contract agreement (the competitive price usually ranges around $100,000 per unit) or from the Outside System at a fixed price of $130,000 per unit.

When awarding contracts for BG or BS, the department must specify the location of the BG or BS establishment, the percentage of its total purchases which it will buy there, as well as the priority which it awards to each establishment.

5. Change District Boundaries ($REDIST)

Each MS plant must serve an MS district and there must only be one MS plant per district. The original districts are printed on first round computer maps. The decision-maker representing the Municipal

Services Department may alter district boundaries at any time. This allows an alternative course of action to building a new plant or upgrading or renovating an old one which is operating over capacity when the plant in an adjacent district may be under capacity. Two districts may not overlap (i.e., serve the same parcel), nor can a district be discontinuous. The parcel on which an MS is located is automatically in its district.

6. Transfer Cash ($CASH)

The Municipal Services Department may transfer cash between its own capital and current accounts, to the capital or current accounts of other departments or the Chairman, or to an economic decision-maker.

7. Change Salaries ($OTHER)

The Municipal Services Department is in competition with business establishments in the economic sector for PM and PL workers to fill jobs. The typical salary per PM worker is $5,000 and the typical salary per PL worker is $2,500.

8. Build, Upgrade or Demolish MS plants ($BUILD or $OUBLD)

The Municipal Services Department may build new MS plants, upgrade (i.e., add an additional level of development) or demolish old ones. Construction may be accomplished either by the local CI or by the Outside System at 1.3 times the typical cost. The typical construction cost of an MS1 is $30,000,000 and the typical demolition cost is $6,000,000. An MS1 can be built by the Outside System at a fixed cost of $39,000,000 and demolished at a fixed cost of $7,800,000. MS plants may be located on any parcel, but only one MS can be on a parcel. All construction requires one full round to complete. An MS1 requires 12% of a square mile.

J. Highway Department (HY)

The Highway Department is concerned with two types of developments: highways and terminals.

1. Highways

a. Types. There are three types of highways in CITY III: HY1, HY2, and HY3. An HY3 is the largest road and it requires 16% of land from each side of the road. An HY2 requires 12% from each side and an HY1 requires 8% from each side. The type of highway (i.e., its "size") determines its design capacity. The design capacity of the three types of highways are 500 road units (HY1); 1000 road units (HY2: and 1500 road units (HY3) per mile segment.

The value ratio of a segment of highway will reduce its design capacity by a function of VR/100 times design capacity; the product is equivalent to effective capacity.

Roads are used by population units to travel to and from employment and shop locations and by basic industry (HI, LI, NS) and commercial establishments (BG, PG, PS) to transport products to terminals and to purchase the necessary goods and services for maintenance and normal operations. Population units travel to work during peak-hour travel only. A population unit consumes 10 road units per mile when traveling to and from work by automobile. Buses also consume road units during peak-hour. A bus (level 1) requires 50 units per mile; a bus (level 2) requires 100 units per mile, and a bus (level 3) requires 150 units per mile.

b. Depreciation. Highways depreciate as a function of use. The annual depreciation rate of a mile segment of highway is 5.0Z where Z is the actual number of road units consumed divided by effective capacity of the road segment.

c. Congestion. Congestion occurs when the use index [(Actual Use/Effective Capacity) x 100] of a highway is greater than 100. Congestion is recorded only during peak-hour travel. When congestion occurs, it takes additional time for population units to travel on highways in the city. The amount of additional time is directly proportional to the amount of congestion on the highway. For example, if the peak-hour congestion is 110%, the time to travel a road is 10% greater than otherwise. Time consumed in transportation to and from work affects the allocation of leisure time in the social sector.

2. Terminals

Terminals (TM) are used by HI, LI, and BG. HI and LI use terminals to ship output to national demanders and BG receives goods from national suppliers. A TM1 supplies 10,000 capacity units; a TM2 supplies 20,000 capacity units; and a TM3 supplies 30,000 capacity units. The consumption requirements of TM users are summarized on the following page.

Land Use	Terminal Capacity Units Consumed
HI	3,000
LI	1,000
BG	1 per unit sold

A terminal can only be in an intersection. Land requirements for terminals are 12% (TM1); 16% (TM2); and 20% (TM3) from each of four corners.

3. Revenues

The Highway Department receives income to its current and capital accounts from various sources. These include:

a. Appropriations. These are funds distributed to the current and/or capital accounts of the department by the Chairman.

b. Federal-State Aid. The Highway Department is eligible for capital federal-state aid for the construction of new highways or the upgrading of existing ones. Aid must be requested from the computer. The chances of a request being accepted are 80% for type 1 construction, 50% for type 2 construction, and 30% for type 3 construction. The matching ratio of Federal-state funds to local funds for a HY1 is 1 federal-state dollar to 9 local dollars; for a HY2, 1:1; and for a HY3, 2:1.

c. Bonds. Current bonds are automatically floated by the computer if the current expenditures of the department exceed its current revenue. Current bonds have a duration of two years and the interest rate is set by the computer. Capital bonds may be floated for the department by the Chairman subject to a referendum by the social sector. Capital bonds have a duration of 25 years and the interest rate is set by the computer.

d. Miscellaneous. This income includes such items as cash transfers to the capital or current account of the department and income from the sale of land (capital account only).

4. Expenditures

The Highway Department spends money on the following items:

a. Road Maintenance. The Highway Department must purchase business goods (BG) and business services (BS) for the maintenance and/or renovation of its roads. BG and BS are purchased by the Highway Department at fixed costs from the Outside System. The goods and services costs per mile maintained for 1% renovation and/or maintenance are outlined below:

Road Type	BG	BS
HY1	$ 7,000	$ 1,000
HY2	14,000	2,000
HY3	21,000	3,000

b. Bond Payments. These include payments on interest and principal of outstanding capital and current bonds floated by the department.

c. Miscellaneous. These expenditures involve cash transfers from the capital or current accounts of the department to an economic or governmental decision-maker, or from one account to another account.

d. Road and Terminal Construction. The Highway Department can build, upgrade or demolish highways and terminals. The "typical" cost of a HY1 is $800,000 per mile, and the "typical" cost of a TM1 is $14,000,000.* Highways and terminals have "typical" demolition costs of $160,000 per mile and $2,800,000 respectively. If a local construction industry (CI) does not offer a fair price, building can be done by the Outside System at fixed prices of $1,040,000 per mile of HY1 and $18,200,000 for a TM1. Outside System demolition costs are $208,000 per mile for a HY1 and $3,640,000 for a TM1.

e. Land Purchase. This includes expenditures for the purchase of land either from a governmental or economic decision-maker or from the Outside System.

f. Miscellaneous. These expenditures involve cash transfers from the capital or current accounts of the department to another government or economic decision-maker, or from one account to another account.

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*Although an HY2 does not require twice as much land as an HY1, its construction cost is double that of an HY1. Likewise, an HY3 costs three times that of an HY1. A TM2 costs twice as much and a TM3 three times as much as a TM1.

K. Highway Department Decisions

The Highway Department is responsible for all roads and terminals in the simulated city. The Highway Department may make any or all of the following decisions during a round of play: purchase land, transfer cash, change maintenance levels, build highways and terminals, request federal-state aid.

1. Purchase Land ($PU)

The Highway Department may purchase land from either of two sources: another decision-maker or the Outside System (i.e., the computer). When purchasing land from another decision-maker, the department must buy undeveloped land in portions of 4% of a square mile (i.e., 4, 8, 12, 16 . . . 92, 96, 100%) and the terms of the purchase are arrived at by mutual agreement. When bidding on land owned by the Outside System, the department must also purchase land in portions of 4%. The bidding price may be determined from the Fair Market Value Map or from other sources available to the department.

When purchasing land for the purpose of building highways, it is important to remember that highways require land from both sides of the road. These requirements are 8% from each side for HY1, 12% from each side for HY2 and 16% from each side for HY3. Terminals require land from all four corners of an intersection. These requirements are 12% from each corner for a TM1, 16% from each corner for a TM2 and 20% from each corner for TM3.

2. Transfer Cash ($CASH)

The Highway Department may transfer cash between its own capital and current accounts, to the capital or current accounts of other departments or the Chairman, or to an economic decision-maker.

3. Change Maintenance Level ($CVPT)

Each type of highway (HY1, HY2, HY3) has a value ratio which describes the quality of the road and affects its capacity. Highways depreciate at a yearly rate of .05Z and where Z is the actual number of road units consumed divided by the effective capacity of the road. Decision-makers in the Highway Department can counter the effects of depreciation (i.e., a declining value ratio) by specifying a maintenance level at which the value ratio of each type of highway is to be maintained. Maintenance and/or renovation (i.e., raising the maintenance level above the value ratio) involves purchases of business goods (BG) and business services (BS) at fixed costs from the Outside System.

4. Build Highways and Terminals ($BUILD or $OUBLD)

The Highway Department may build new highways or terminals, upgrade (i.e., add an additional level of development) or demolish old ones. Construction may be accomplished by either a local CI or the Outside System at 1.3 times the typical cost. Typical construction costs are $800,000 per mile for an HY1 and $14,000,000 for a TM1. Demolition costs are $160,000 for an HY1 and $2,800,000 for a TM1. Highways and terminals can also be built and/or demolished by the Outside System at fixed costs. Construction costs are $1,040,000 (HY1) and $18,200,000 (TM1). Demolition costs are $208,000 (HY1) and $3,640,000 (TM1). Terminals must be located on intersections and road units located on road beds (i.e., vertical and horizontal coordinates). All construction requires one full round to complete.

5. Request Federal-State Aid ($FSA)

The Highway Department is eligible for capital Federal-state aid for the construction of new highways and the upgrading of highways at specified locations. The chances of a request being granted are about 80% for construction of level one highways, 50% for construction of level two highways, and 30% for construction of level three highways. The matching ratio of Federal-state funds to local funds for one level of construction is 1:9; for two levels of construction, 1:1; and for three levels of construction, 2:1.

L. Planning and Zoning Department (PZ)

The Planning and Zoning Department is responsible for zoning, the acquisition of parkland and the creation and demolition of public institutional land.

1. Zoning

As the name of the department implies, the powers of this department go somewhat beyond zoning. This department has the powers at its disposal to develop a master plan for the city for future redevelopment. It may regulate at its discretion the location of all private construction by enforcing zoning codes to which private developers must conform. The implication of this power is that the players can exercise control over the type of development built in the city. They have the ability to zone areas for suburban residential development, industrial parks, recreation areas, etc., at their own discretion. The amount of planning which would be instituted is up to the individual players representing the Planning and Zoning Department.

2. Parkland and Public Institutional Land

The Planning and Zoning Department has responsibility for two types of public land uses: parkland and public institutional land. Parkland is equivalent to open space recreational areas and is used by the social sector when they allocate time to recreation. Public institutional land is equivalent to parkland with developments and represents such things as museums, zoos, libraries and public golf courses. Public institutional land can be created on parkland at a cost of $1,000,000 per 4% of a parcel. Demolition costs per 4% are $200,000. All costs are paid to the Outside System.

3. Revenues

The Planning and Zoning Department receives income to its capital account (it has no current account) from various sources. These include:

a. Appropriations. These are funds distributed to the department by the Chairman.

b. Bonds. Capital bonds may be floated for the department by the Chairman subject to the approval of the social sector. Capital bonds have a duration of 25 years and the interest rate is set by the computer.

c. Federal-State Aid. The Planning and Zoning Department is eligible for capital Federal-state aid for the purchase of parkland, which may later be developed as public institutional land use.

d. Miscellaneous. This income includes such items as cash transfers to the capital account of the department and income from the sale of land.

4. Expenditures

The Planning and Zoning Department spends money on the following items:

a. Bond Payments. This includes payments on interest and principal of outstanding capital bonds floated by the department.

b. Land Purchase. This involves purchases of undeveloped land from a governmental or economic decision-maker or the Outside System for the purpose of providing parkland.

c. Public Institutional. This is an expenditure for the development of parkland into public institutional use. Demolition of public institutional uses is included in this item.

d. Miscellaneous. These expenditures involve cash transfers from the capital account of the department to an economic or governmental decision-maker.

M. Planning and Zoning Department Decisions

In order to accomplish its objectives, the Planning and Zoning Department may make any or all of the following decisions during a round of play: purchase land, change zoning, transfer cash, request Federal-state aid, and create or demolish institutional land uses.

1. Purchase Land ($PU)

The Planning and Zoning Department may purchase land from either of two sources: another decision-maker or the Outside System (i.e., the computer). When purchasing land from another decision-maker, the department must buy undeveloped land in portions of 4% of a square mile (i.e., 4, 8, 12, 16, . . . 92, 96, 100%) and the terms of the purchase are arrived at by mutual agreement. When bidding on land owned by the Outside System, the department must also purchase land in portions of 4%. The bidding price may be determined from the Fair Market Value Map or from other sources available to the department.

Any undeveloped land owned by the Planning and Zoning Department is parkland (unless developed in public institutional use) and is used by population units for recreation. One square mile of parkland provides recreational space for 120,000 time units of time allocated for recreation.

2. Change Zoning ($CVPT)

The Planning and Zoning Department may change the zoning of any parcel at any time. The various zoning codes in CITY III are:

Land Use	Classification
Any Use	00 or --
Any Business	10
Any Manufacturing	20
HI	21
LI	22
CI	23

Land Use	Classification
All Non-Manufacturing	30
NS	31
BG	32
BS	33
PG	34
PS	35
Any Residential	40
RA	41
RB	42
RC	43
Parkland	50

The original zoning for the simulated area is printed on first round computer maps. If the zoning for a parcel with an economic land use on it is changed to a code prohibiting that land use, it means that no further increments (levels of development) of that land use can be built there.

3. Transfer Cash ($CASH)

The Planning and Zoning Department may transfer cash to the capital or current accounts of other departments or to the Chairman, or to an economic decision-maker.

4. Request Federal-State Aid ($FSA)

The Planning and Zoning Department may file up to 3 requests per round for capital Federal-state aid for the purchase of parkland. Aid for parkland does not need to be specified for specific locations. The chances of a request being granted are about 15%, but the probability of acceptance increases as the amount of request decreases and the existing ratio of population/square mile of parkland increases.

5. Create or Demolish Public Institutional Land Uses ($CVPT)

The department may develop parkland into public institutional uses at a cost of $1,000,000 per 4% of a parcel (demolition costs $200,000 per 4% of a parcel). All costs are paid to the outside economy. One square mile of public institutional land can serve 100,000 people on the national average.

N. Utility Department (UT)

The Utility Department is responsible for providing utilities such as gas, water and electric power to economic developments. Units of utility service are provided by utility plants. Utility plants have three possible development levels. A UT1 requires 20% of a square mile.

1. Installation of Service

When providing service to a parcel, the Utility Department installs levels of service.* There may not be more than 9 levels of service on a parcel. Each level of service provides a certain number of utility units. At least as many units must be provided as an economic activity requires for operation. Once supplied service may not be taken away from a parcel. The installation costs for providing levels of service are fixed and deducted from the financial accounts of the department by the computer. This information is summarized below:

Levels of Service	Installation Costs	Utility Units Installed
1	$ 2,000,000	100
2	4,000,000	200
3	5,000,000	300
4	6,000,000	400
5	8,000,000	500
6	11,000,000	600
7	14,000,000	700
8	18,000,000	900
9	28,000,000	1,300

There is no design capacity of a utility plant. In terms of operating cost, however, a UT1 has a least cost (per unit) capacity of 1500 units. The variable cost function of a UT1 is given below:

Utility Units Served	Per Unit Operating Cost	Total Operating Cost
300	$ 20,000	$ 6,000,000
600	13,333	8,000,000
900	9,629	8,666,667
1,200	7,777	9,333,333
1,500	6,667	10,000,000
1,800	7,407	13,333,333
2,100	7,936	16,666,667
2,200	8,080	17,777,778
2,500	8,444	21,111,111
2,800	8,730	24,444,444

[NOTE: If 1500 units is the least cost capacity of a UT1, this means that if the per unit operating cost is above $6,667, the plant is not operating at its optimum productivity level. Maximum profit also occurs at 1500 units served.]

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*Levels of Service installed on a parcel (1 through 9) should not be confused with the development level (1 through 3) of a utility plant.

The units which a utility plant serves are the equivalent of the drain of utility units by the land uses which require utility service. The utility requirements of the various land uses are given below.

Land Use Type*	Utility Requirements (Units)
HI1	402
LI1	135
NS1	76
BG1	112
BS1	71
PG1	99
PS1	77
RA1	4
RB1	26
RC1	117

2. Revenues

Unlike other departments, the Utility Department is a quasi private company and cannot receive income to its current or capital accounts from direct appropriations from the Chairman. The department can, however, receive income from any of the following sources:

a. Subsidies. These are public subsidies granted by the Chairman to the current or capital accounts of the department.

b. Bonds. Current bonds are automatically floated by the computer if the current expenditures of the department exceed its revenues. Current bonds have a duration of two years and the interest rate is set by the computer. Capital bonds may be floated for the department by the Chairman, subject to a referendum by the social sector. Capital bonds have a duration of 25 years and the interest rate is determined by the computer.

c. Miscellaneous. These revenues include such items as cash transfers to the capital or current accounts of the department and income from the sale of land (capital account only).

d. Income from Users. Since the Utility Department can set a price for its service, it earns income for every unit of service which is consumed by the economic sector land uses. The "typical" price charged by the department is $10,000 per unit of service. The computer deducts all utility charges from the accounts of the economic activities and credits income to the Utility Department.

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*Development level is a multiple for determining utility requirements. For example, a PG3 would require 297 utility units.

3. Expenditures

The Utility Department spends money on the following items:

a. Operating Costs. Total operating costs were discussed earlier. Operating costs increase with the number of utility units served; but the per unit operating cost is least at 1500 units.

The methods for determining operating costs are outlined below:

Let X = the number of utility units drained

if $x \leq 600$,

$$\text{Cost} = \frac{\$4,000,000}{600}(x) + \$4,000,000$$

if $600 < x \leq 1,500$,

$$\text{Cost} = \frac{\$2,000,000}{900}(x - 600) + \$8,000,000$$

if $x > 1,500$,

$$\text{Cost} = \frac{\$10,000,000}{900}(x - 1500) + \$10,000,000$$

b. Miscellaneous. These expenditures include cash transfers from the capital or current accounts of the department to an economic or governmental decision-maker, or from one account to another account.

c. Bond Payments. These include payments on interest and principal of any outstanding capital or current bonds floated by the department.

d. Plant Construction. This includes funds expended for the construction of a new utility plant, the upgrading of an old one, or the demolition of an existing one. Utility plants must be constructed by the Outside System. A UT1 has a fixed construction cost of $30,000,000 and a fixed demolition cost of $6,000,000.

e. Extension of Service. These costs include installation costs for levels of service and redistricting costs. The costs of supplying utility service to a parcel are listed on the following page.

Levels of Service	Installation Costs
1	$2,000,000
2	4,000,000
3	5,000,000
4	6,000,000
5	8,000,000
6	11,000,000
7	14,000,000
8	18,000,000
9	28,000,000

There is also a fixed cost of $1,000,000 for redistricting one parcel already being served by a plant to another plant.

f. Land Purchase. This includes expenditures for the purchase of land either from governmental or economic decision-makers or from the Outside System.

O. Utility Department Decisions

In order to provide service and improve its operations, the Utility Department may make any or all of the following decisions during a round of play: purchase land, change level of utility service, transfer cash, change prices, and build utility plants.

1. Purchase Land ($PU)

The Utility Department may purchase land from either of two sources: another decision-maker or the Outside System (i.e., the computer). When purchasing land from another decision-maker, the department must buy undeveloped land in portions of 4% of a square mile (i.e., 4, 8, 12, 16 . . . 92, 96, 100%) and the terms of the purchase are arrived at by mutual agreement. When bidding on land owned by the Outside System, the department must also purchase land in portions of 4%. The bidding price may be determined from the Fair Market Value Map or from other sources available to the department.

2. Change Level of Utility Service ($CVPT)

In response to demands for increased utility service, the Utility Department can install additional levels of service to each parcel in the simulated area or change the utility plant serving a parcel. The costs of installing additional service were explained earlier.

When installing service, the department must make sure that the new area being served is contingent to a parcel which already has at least one level of service installed by the same plant. There is a fixed cost of $1,000,000 for changing service at a parcel from one utility plant to another.

3. Transfer Cash ($CASH)

The Utility Department may transfer cash between its own capital and current accounts, to the capital or current accounts of other departments or the Chairman, or to an economic decision-maker.

4. Change Prices ($OTHER)

The Utility Department can change the prices which it charges per unit of utility service. The "typical" price of utility service is $10,000 per unit.

5. Build and Demolish Utility Plants ($OUBLD)

The Utility Department may build new plants or upgrade and demolish existing ones. The fixed construction cost of a UT1 is $30,000,000. Construction is completed in the same round that the contract is submitted to the computer.

A utility plant which is serving no parcels may be demolished at a cost of $6,000,000. All parcels which were previously served by such a plant must be allocated to other plants before the computer will accept the demolition. Also, any economic developments on the same parcel as the plant must be demolished before the plant.

P. Bus and Rapid Rail Companies

Although the Bus and Rapid Rail Companies are separate quasi-private departments, they will be treated in the same section due to the similarities between the two. Neither is limited to a single jurisdiction; both have interjurisdictional authority.

The Bus Company and Rapid Rail Company provide additional modes of transportation (besides automobile) to the population units who live and work in the simulated area. Population units take bus or rail to work only; they do not use either mode of transportation for shopping.

1. Capacity

The Bus and Rapid Rail Companies own rolling stock with three possible levels of service (1, 2, and 3). Level of service indicates the actual number of buses or railroad cars which may serve a particular route.

The number of passengers (capacity that can be effectively served by a rail or bus route is determined by its level of service. A bus route with a level of service of 1 has a design capacity of 3,000 passengers and a rail route with a level of service of 1 has a design capacity of 6,000 passengers.* Like highways, the design capacity of a bus or rail route is not necessarily its effective capacity. Effective capacity is determined by multiplying the value ratio of equipment divided by 100 times the design capacity. For example, if the value ratio of equipment for the Bus Company is 85, the effective capacity of a level 2 bus route is 5100. Effective capacity can be further reduced by employment. If the Bus or Rapid Rail Company receives only 75% of the employees which it requested, the actual effective capacity of that route is 75% (i.e., in the previous example .75 x 5100 = 3825).

It must be noted, however, that effective capacity does not refer to the number of people who actually use a bus or rail. A bus or rail route may serve less or more people than its effective capacity. For example, the bus service with an effective capacity of 3825 may actually be used by 6,000 people. In such a case the computer has decided for these people (see "The Employment Process") that, despite the overcrowding, it is still cheaper in terms of time and money to take a bus rather than another mode of transportation.

2. Equipment

The Bus and Rapid Rail Companies do not buy individual pieces of rolling stock. Rather, they purchase units of equipment for each mile of service. One unit of equipment costs $10,000. Forty units of equipment are required to operate a bus (level of service = 1) for one mile and 80 units of equipment are required to operate a rail (level of service = 1) for one mile. Equipment is purchased from the Outside System and its costs are automatically deducted by the computer.

3. Depreciation and Maintenance

Bus and rail equipment which is used depreciates at an average rate of 3.5% per annum. Goods and services for maintenance are automatically purchased from the Outside System (i.e., the computer) at fixed prices. The costs of 1% maintenance or renovation are $40 per equipment unit (goods) and $60 per equipment unit (services).

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*Levels of service are multiples of other factors. For example, a rail with three levels of service has a design capacity of 18,000 passengers, three times as much equipment and three times as many employees as a rail at the one level of service.

4. Employment

The Bus and Rail Companies employ workers from middle income population units (PM) only. They obtain their workers through the usual employment process handled by the computer. One PM (160 workers) supplies 1,000 units of labor and 50 units of labor are required to operate a bus (level of service = 1) or rail (level of service = 1) for one mile. One PM of workers therefore serves 20 miles of a BUS1 or RAIL1.

5. Passenger Assignments

Passengers are assigned to travel to work by bus and/or rail by the computer. The basis upon which a population unit may or may not be assigned to bus or rail transportation is the dollar value of their time. This value is assigned by social decision-makers. The normal dollar value of a time unit [based on typical salaries of $2,500 per low income (PL) worker, $5,000 per middle income (PM) worker, and $10,000 per high income (PH) worker] is $25 for a PL, $50 for a PM and $100 for a PH.

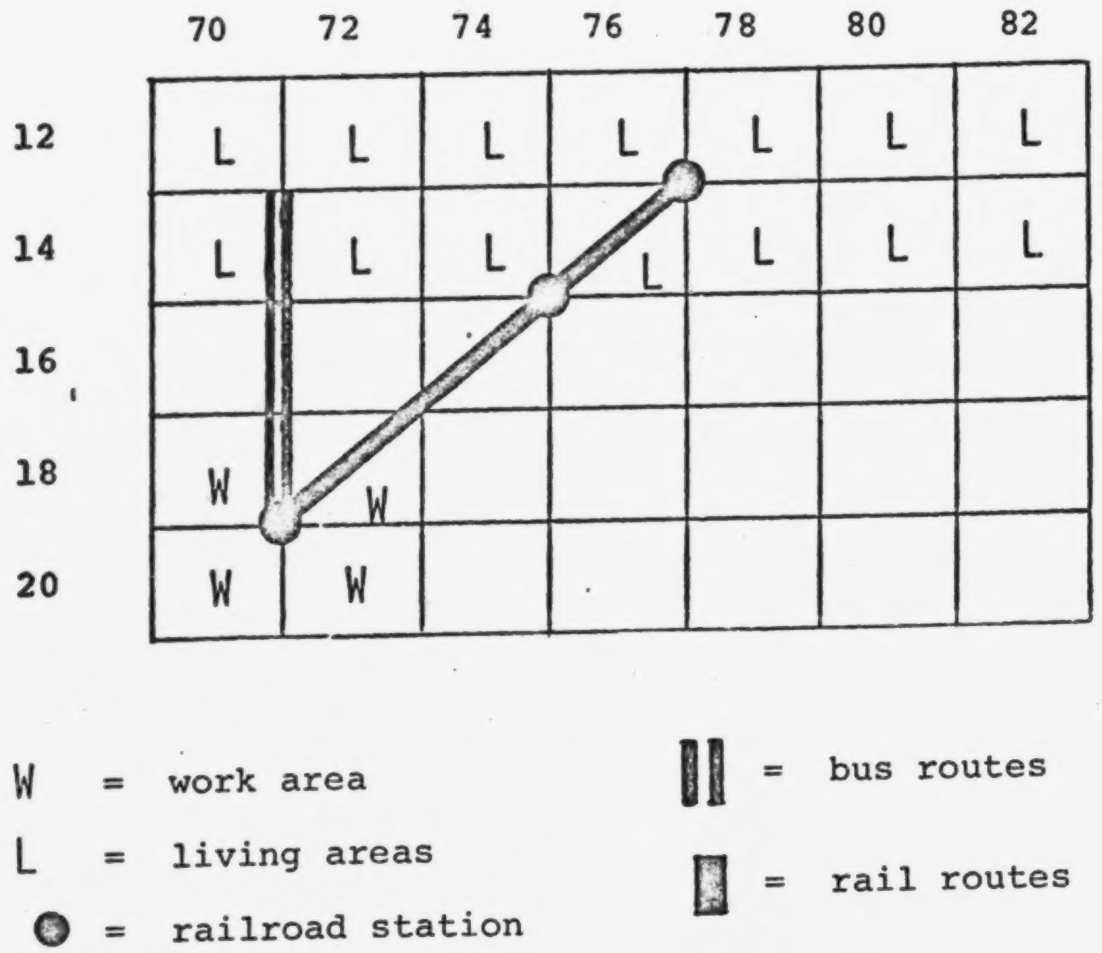
Those population units with the lowest dollar value of time will take the cheapest but probably the longest route of transportation to work. Those population units with a high dollar value of time will take a more expensive but quicker mode of transportation to work.

The following example will demonstrate how the computer considers the dollar value of time. Let us say the transportation costs of a population unit are $150 per year to get to work by bus and $320 to get to work by auto. It also requires an extra 4 time units to travel by bus instead of auto. If the dollar value of time for that population unit was set at $40, it would cost them $150 plus 4 time units times $40 (dollar value) or $310 to get to work by bus. To take auto, it costs $320 (no extra time units consumed). Therefore, the computer would assign the population unit the bus mode to travel to work (i.e., $310 < $320).

In the same case, suppose the dollar value of time was set to $50. Then, the total bus cost would be $150 plus 4 time units times $50 (dollar value) or $350. Auto would cost only $320. Therefore, the computer would assign these population units the auto mode to work (i.e., $320 < $350).

6. Routes

Buses travel along roads and trains go along tracks. The Bus Company must therefore specify routes only on existing highways, while the Rail Department can have routes wherever they build tracks, including on the diagonal across parcels and either overground or underground. Routes must begin and end at intersections. Further, although bus and rail transport workers to and from their place of employment, the direction of the route is specified in order to meet residence to work demands. For example, assume that people live in the parcels above the line 15 and that most employment locations are at parcels 7018, 7218, and 7020 and 7220.



The routes that should be specified are the morning routes that bring people to work. In this instance they are 7113 to 7119 (for bus) and 7713 to 7119 (for rail). A bus stops at every intersection but a rail will stop only where there are stations and there can only be stations at intersections. In the example above therefore, the rail has three stops: 7713, 7515, and 7119. In planning routes decision-makers for bus and rail will often discover that a key element involves the proximity of stops to parcels where the greatest number of people work and/or live.

7. Land Requirements

Although buses do not require land (they operate on highways), surface rail tracks require 4% of land (on either side) per mile. In the case of a diagonal track, it requires 4% of the land from each parcel which it crosses. All land must be purchased by the company prior to the construction of tracks. Underground rail tracks do not require land.

8. Revenues

Like the Utility Department, the Bus and Rapid Rail Companies are quasi-private departments and therefore do not receive direct appropriations from the Chairman. Both companies, however, can receive income from any of the following sources:

a. Subsidies. These are public subsidies granted by the Chairman to the current or capital accounts of either company.

b. Bonds. Current bonds are automatically floated by the computer if the current expenditures of either company exceed current revenues. Current bonds have a duration of two years and the interest rate is set by the computer. Capital bonds may be floated for either company by the Chairman subject to a referendum by the social sector. Capital bonds have a duration of 25 years and the interest rate is determined by the computer.

c. Fares. The primary source of income for the Bus Company and Rail Company is the fares which they charge to passengers who use their service. Fares are deducted by the computer from the accounts of population units represented by social decision-makers on the basis of 250 trips to work and 250 trips from work each year (round).

d. Miscellaneous. These revenues include such items as cash transfers to the capital or current accounts of either company and income from the sale of land (capital account of Rail Company only).

9. Expenditures

The Bus and the Rail Companies spend money on the following items:

a. Vehicle Maintenance. This includes the cost of maintenance and renovation costs of vehicles owned by the companies. It involves purchases of goods and services at fixed prices from the Outside System (i.e., the computer). The costs of 1% renovation or maintenance are $40 (goods) and $60 (services) per equipment unit.

b. Salaries. Since both companies hire middle income (PM) workers, they must offer competitive salaries. The "typical" salary per PM worker is $5,000. There are 160 workers in a PM.

c. Bond Payments. These include payments on interest and principal of any outstanding capital or current bonds floated by either company.

d. Miscellaneous. These expenditures include cash transfers from the capital or current accounts of the company to an economic or governmental decision-maker, or from one account to another account.

e. Vehicle Purchase. This is a capital expenditure for the purchase of rolling stock. One unit of equipment (either bus or rail) has a fixed cost of $10,000. If any stock is sold, this item will subtract the selling price of stock and may indicate a negative number which will be credited to the capital account of the company. The selling price of a unit of equipment is defined as: .50 times value ratio of equipment/100 times $10,000.

f. Station Construction. (Rail Company only) This includes expenditures for building stations. All stations are built by the Outside System and have a fixed construction cost of $1,000,000 and a demolition cost of $200,000.

g. Track Construction. (Rail Company only) This includes expenditures for the construction or upgrading of rail tracks. All tracks are built by the Outside System and have a fixed construction cost of $4,000,000 per mile (surface tracks) and $14,000,000 per mile (underground tracks). Demolition costs are $800,000 per mile (surface tracks) and $2,800,000 per mile (underground tracks). The cost of diagonal tracks is a function of the hypotenuse of the triangle formed by the rail segment. This relationship is explained below:

Distance for Diagonal Rapid Rail Segments

Horizontal Distance Between Stations

		1	2	3	4	5
	1	1.414	2.236	3.162	4.123	5.090
Vertical	2	2.236	2.828	3.606	4.472	5.385
distance	3	3.162	3.606	4.243	5.000	5.831
between	4	4.123	4.472	5.000	5.657	6.403
stations	5	5.099	5.385	5.831	6.403	7.071

In other words, a segment of surface track crossing a single (one square mile) parcel diagonally does not cost $4,000,000, but 1.414 times 4,000,000 or $5,656,000.

h. Land Purchase. (Rail Company only) This item includes expenditures for land purchased from the governmental or economic sectors or from the Outside System (i.e., the computer).

Q. Bus and Rapid Rail Company Decisions

In order to operate efficient modes of transportation, the Bus and Rail Companies may make any or all of the following decisions during a round of play: change level of service, change routes, tranfer cash, purchase or sell stock, set fares, change salary, change maintenance level, purchase land and build rail lines and stations.

1. Change Level of Service ($ROUT)

The Bus and Rail Companies may increase or decrease the level of service on a particular route. There are three possible levels of service for each mode of transportation. The design capacity (i.e., number of passengers that can be served) of each level of service is:

Level of Service	Design Capacity (Passengers)	
	Bus	Rail
1	3,000	6,000
2	6,000	12,000
3	9,000	18,000

When changing levels of service, the Bus and Railroad Companies should make sure that they have purchased sufficient equipment for servicing the routes. The equipment requirements are:

Level of Service	Equipment Requirements (Units)	
	Bus	Rail
1	40 per mile	80 per mile
2	80 per mile	160 per mile
3	120 per mile	240 per mile

[Note: The Bus Company can form a new route merely by adding at least 1 level of service to a previously non-existent route. The Railroad Company, however, must purchase land and construct tracks in order to form a new route.]

2. Purchase or Sell Rolling Stock ($OTHER)

The Bus and Rail departments may purchase new units of equipment or sell old equipment. One equipment unit costs $10,000. The price received for used equipment (sold to the Outside System) is defined as: .50 times value ratio of equipment/100 times $10,000.

3. Set Fares ($OTHER)

The Bus and Rail Companies may set the base and per mile fares to be paid by passengers. Fares are automatically collected from the accounts of population units represented as social decision-makers by the computer. Fares are computed on the basis of 250 trips to work and 250 trips from work per year (round).

4. Change Salary ($OTHER)

The Bus and Rail Companies may specify the salary to be paid to its middle income (PM) workers. The typical salary per PM worker is $5,000. There are 160 workers in a PM.

5. Change Maintenance Level ($OTHER)

In order to counter depreciation, the Bus and Rail Companies may specify the level at which the average value ratio of rolling stock is to be maintained. Maintenance involves purchases of goods and services from the Outside System at fixed costs of $40 (goods) and $60 (services) per equipment unit per 1% maintenance.

6. Transfer Cash ($CASH)

The Bus and Rail Companies may transfer cash between their own capital and current accounts, to the capital or current account of another department, or to an economic decision-maker.

7. Purchase Land ($PU)

The Rail Company only purchases land. Land may be purchased from another decision-maker or from the Outside System. A rail requires 4% of a square mile (from either side) for surface tracks, regardless of the level of service.

8. Build Rail Lines and Stations ($RAIL)

The Rail Company may construct rail lines or stations. The fixed costs of a rail line are $14,000,000 per mile for underground and $4,000,000 per mile for surface tracks. A station costs $1,000,000. All construction costs are paid to the Outside System. Tracks and stations may not be demolished.

V. COMPUTER OUTPUT

The computer output is one of the most important components of the CITY III operation. It portrays the economic, social and government status of the simulated area at a given point in time. Players make decisions and feed them to the computer. New output is printed which describes the changes that have occurred.

Since all output contains a lot of numbers, it is most important that participants understand the numerical parameters in CITY III. These numbers are discussed in the chapters for each sector and summarized in the Master Sheets (Chapter VII). It is recommended that participants refer often to the Master Sheets when analyzing their output.

There are two types of output in CITY III. General output, Sections A through F, is for use by all participants; it is important to all three sectors. All other output is distributed to a particular decision-maker in the economic, social or governmental sector. Furthermore, the decision-maker for which this output is intended is identified on the heading of the output.

An explanation and samples of the output for the various sectors follow:

A. Status Maps

1. Economic Status Map (Figure 1)

This map shows all of the roads and terminals and at most five things for all privately owned parcels of land:

a. Ownership - which economic decision-maker owns a particular parcel. (Upper left hand corner)

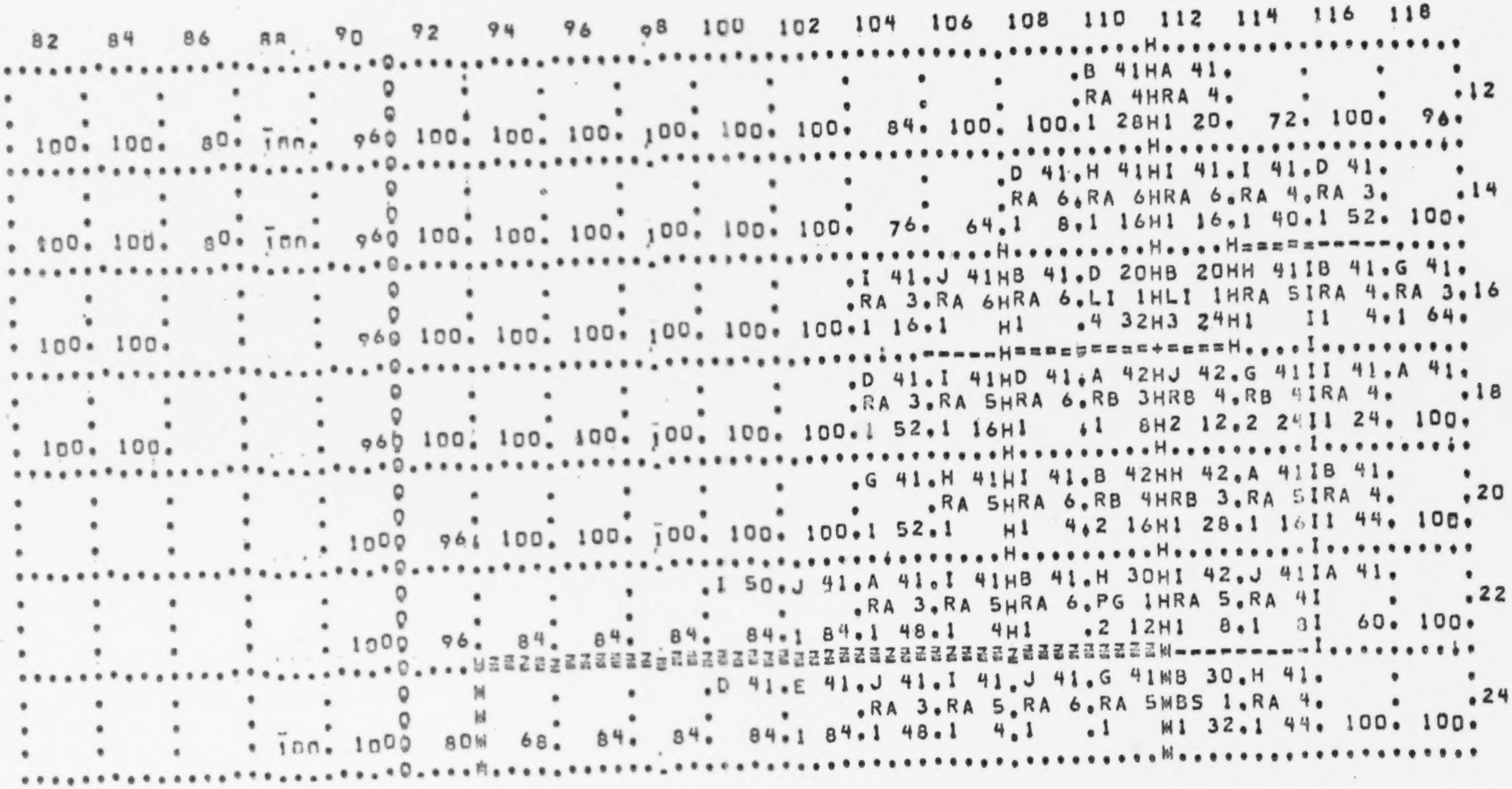
b. Zoning - the zoning classification of a particular parcel. (Upper right hand corner)

The zoning codes (set by the Planning and Zoning Department) are:

Land Use	Code
Any Use	00
Any Business (includes HI, LI, NS, CI, BG, BS PG, PS)	10
Any Manufacturing	20
HI	21
LI	22
CI	23
Any Non-Manufacturing	30
NS	31
BG	32
BS	33
PG	34
PS	35
Any Residential	40
RA	41
RB	42
RC	43
Parkland	50

c. Land Use Type and Level of Development - the kind of land use which exists on a particular parcel and its level of development (Center).

FIGURE 1



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..........................................................................................
   ECONOMIC STATUS MAP                                                        ROUND  1
..........................................................................................

  82   84   86   88   90   92   94   96   98  100  102  104  106  108  110  112  114  116  118
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. 100. 100.    .    .  960 100. 100. 100. 100. 100. 100.1 52.1 16H1   .1  8H2 12.2 24I1 24. 100.
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.    .    .    .    .    0    .    .    .    .    .    .G 41.H 41HI 41.B 42HH 42.A 41IB 41.    .
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.    .    .    .    . 1000  96. 100. 100. 100. 100. 100.1 52.1   H1  4.2 16H1 28.1 16I1 44. 100.
.........................0.......................................H.........H.........I..........
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.    .    .    .    .    0    .    .    .    .    .    .RA 3.RA 5HRA 6.PG 1HRA 5.RA 4I    .    .22
.    .    .    .    . 1000  96.  84.  84.  84.  84.1 84.1 48.1  4H1   .2 12H1  8.1  8I  60. 100.
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.    .    .    .    .    0    W    .    .    .D 41.E 41.J 41.I 41.J 41.G 41WB 30.H 41.    .    .
.    .    .    .    .    0    W    .    .    .    .    .RA 3.RA 5.RA 6.RA 5WBS 1.RA 4.    .    .24
.    .    .    . 100. 1000  80W  68.  84.  84.  84.1 84.1 48.1  4.1   .1   W1 32.1 44. 100. 100.
.........................0....W............................................W....................

              PARCELS                               ROADS                     TERMINALS
   TOP LEFT:      OWNER                     .. ..   ROADBED                   +   TYPE 1
   TOP RIGHT:     ZONING                    -- II   TYPE 1                    X   TYPE 2
   MIDDLE:        LAND USE AND LEVEL        == HH   TYPE 2                    .   TYPE 3
   BOTTOM LEFT:   UTILITY LEVEL             ZZ WW   TYPE 3
   BOTTOM RIGHT:  % UNDEVL. LAND            00 00   JURISDICTION BOUNDARY
```

There are eleven economic land uses. They are:

Basic Industry	
HI	Heavy Industry: steel, petroleum, etc.
LI	Light Industry: electronics, pharmaceutical, etc.
NS	National Services: insurance, consulting, etc.
Construction Industry	
CI	Construction: building, upgrading, demolition
Commercial Establishments	
BG	Business Goods: intermediate products, raw materials, etc.
BS	Business Services: computer, accounting, legal, etc.
PG	Personal Goods: food, drugs, appliances, etc.
PS	Personal Services: banking, restaurants, etc.
Residences	
RA	Single family housing
RB	Townhouses, garden apartments
RC	Highrise apartment building

Development level ranges from 1 to 3 for all uses, except residences, which have 8 possible levels. Development level indicates the size of the building and is a multiplier which determines capacity, land requirements, employment requirements, etc.

d. Percent of Undeveloped Land - the amount of land which is privately owned but undeveloped on a given parcel. (Lower right hand corner)

All economic land uses require a percentage of the parcel for development. The land requirements of economic land uses at the first level of development are:

Land Use	% of Square Mile
HI1	28
LI1	24
NS1	20
CI1	20
BG1	24
BS1	20
PG1	16
PS1	12
RA1	12
RB1	12
RC1	12

If an economic decision-maker does not own 100% of a parcel, it is because there may be government land uses on that parcel (i.e., a road, utility plant, school, municipal service plant, terminal, parkland) or the land may be preempted from local use. To determine the location of government land uses, see Government Status Map. Preempted land is shown on Preempted Land Map.

Land uses at other levels of development require land in direct proportion to the level. For example, an HI2 requires 56% of a square mile, and an RB6 requires 72% of a square mile.

e. Level of Utility Service - the level of utility service made available by the utility plant serving that parcel. (Lower left hand corner)

The utility requirements for the various economic land uses (at the first level of development) are:

Land Use	Utility Units Required	Minimum Level of Service
HI1	402	5
LI1	135	2
NS	76	1
BG1	112	2
BS1	71	1
PG1	99	1
PS1	77	1

Land Use	Utility Units Required	Minimum Level of Service
RA1	4	1
RB1	26	1
RC1	117	2

2. Government Status Map (Figure 2)

This map shows the location of the following government land uses:

a. Schools - the location and development level of all schools. (Indicated by "S" in upper right corner).

b. Percent of Parcel in Parkland - the location and amount of all parkland. The amount of parkland is given in percentages of the square mile parcel. (Indicated by number in center).

c. Utility Plant - the location and level of development of all utility plants. (Indicated by "U" in the lower right corner).

d. Municipal Services Plants - the location and development level of all MS plants. (Indicated by "M" in the lower left corner)

3. Social Decision-Maker Map (Figure 3)

This map indicates which social players make decisions for the low, middle, and high income population units on parcels. The top letter on a given parcel represents the social decision-maker who controls the PM's who live there, and the lower letter represents the social decision-maker who controls the PL's who live there. If a particular class does not live on that parcel, it is not controlled by the decision-maker indicated. However, that decision-maker will control that class if it ever moves to that parcel.

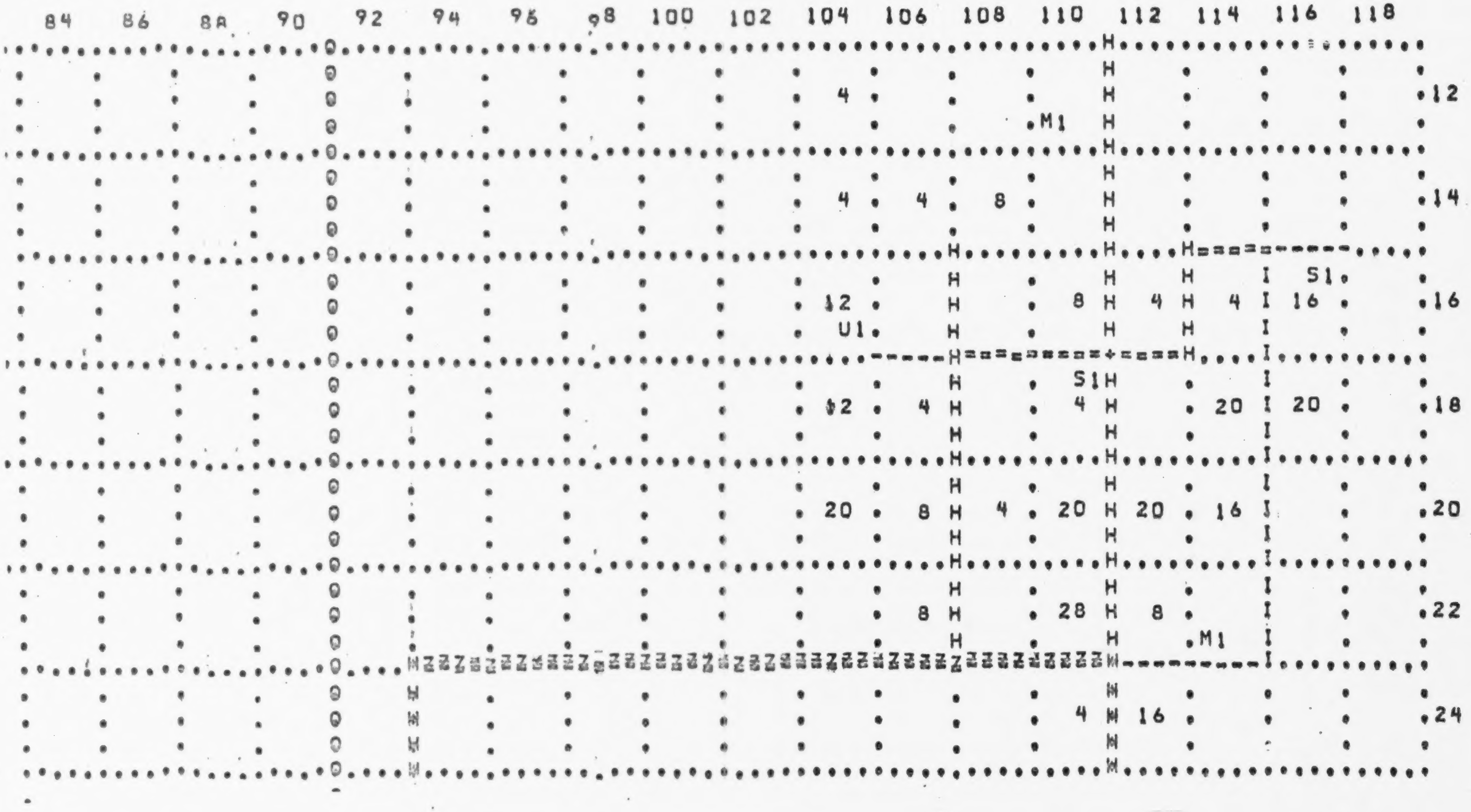
Not until a parcel is developed for residential land use will the social decision-makers for that parcel appear on this map.

4. Preempted and Public Institutional Land Map (Figure V-4)

This map shows the percent of each parcel which is undevelopable due to terrain such as lakes and mountains

FIGURE 2

GOVERNMENT STATUS MAP ROUND 1


84 86 88 90 92 94 96 98 100 102 104 106 108 110 112 114 116 118
12
14
16
18
20
22
24
M1
S1
U1

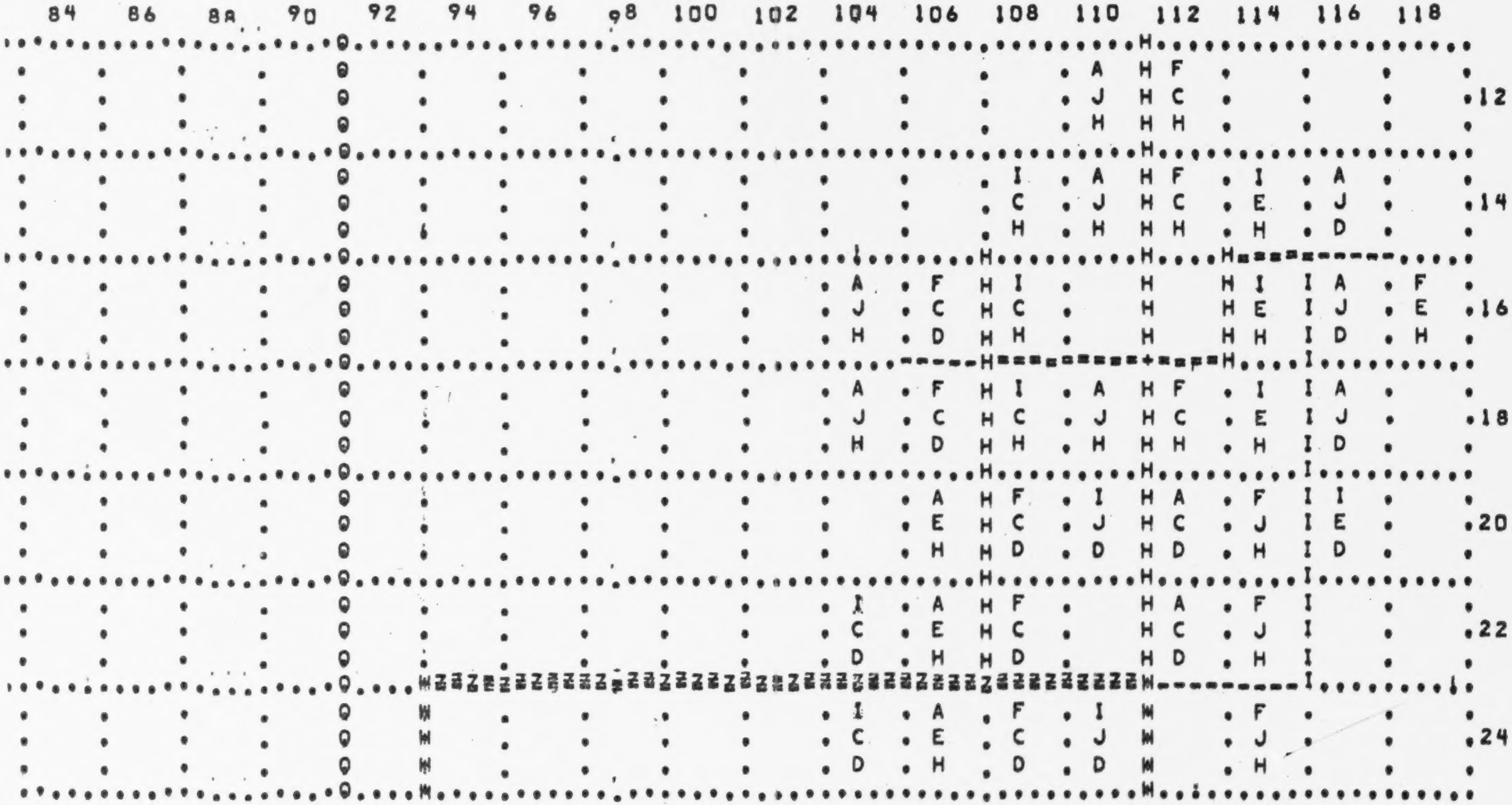
PARCELS
TOP RIGHT: SCHOOL AND LEVEL
MIDDLE: % PARKLAND
BOTTOM LEFT: MS UNIT AND LEVEL
BOTTOM RIGHT: UTILITY PLANT AND LEVEL

ROADS
•• •• ROADBED
-- II TYPE 1
== HH TYPE 2
ZZ WW TYPE 3
OO OO JURISDICTION BOUNDARY

TERMINALS
+ TYPE 1
X TYPE 2
• TYPE 3

FIGURE 3

```
SOCIAL DECISION MAKERS                                                  ROUND 1
```


84
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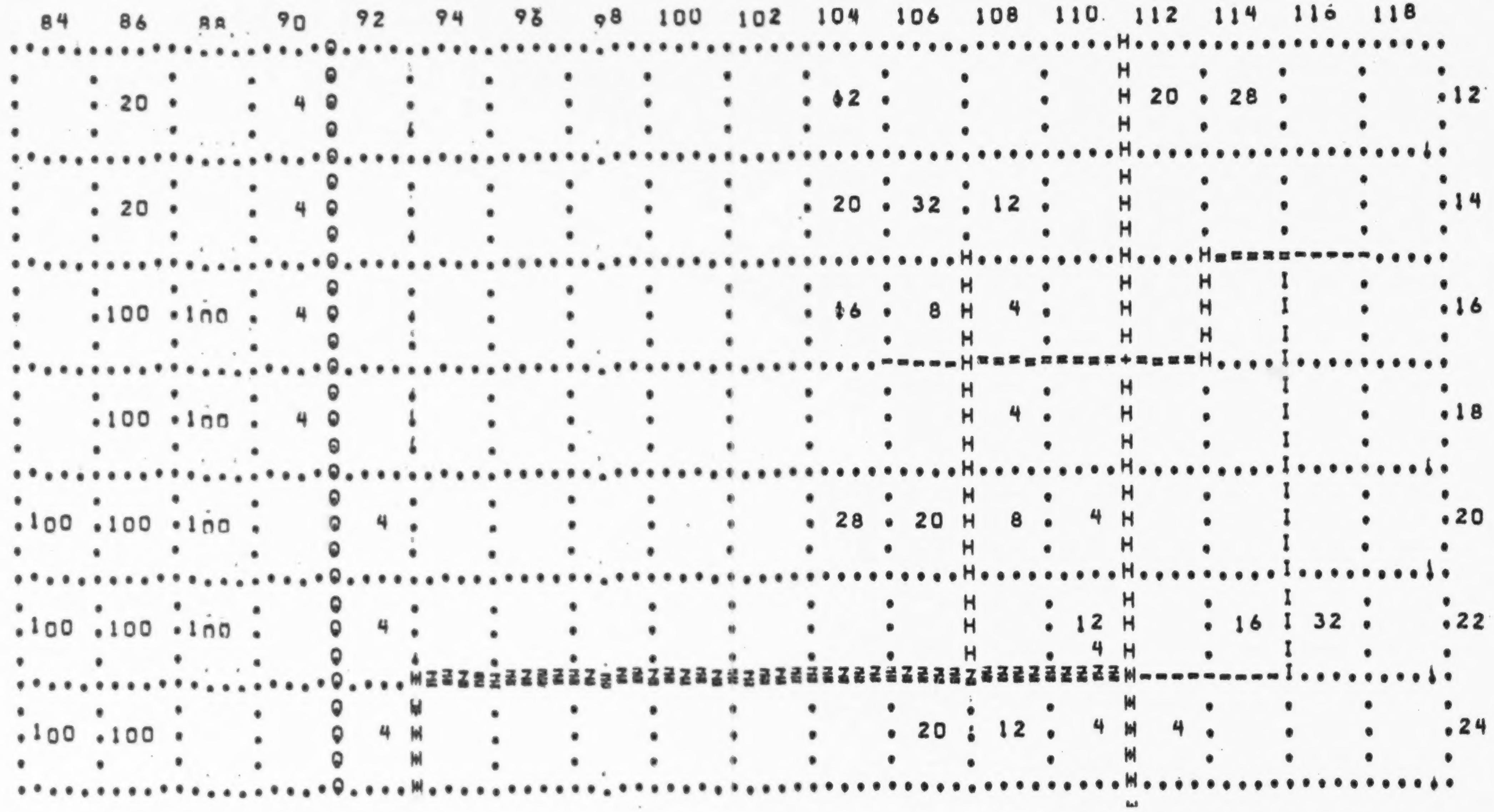
24

```
         PARCELS                    ROADS                 TERMINALS
TOP:     HIGH-INCOME       .. ..    ROADBED               +  TYPE1
MIDDLE:  MIDDLE-INCOME     -- II    TYPE 1                X  TYPE 2
BOTTOM:  LOW-INCOME        == HH    TYPE 2                •  TYPE 3
                           ZZ WW    TYPE 3
                           00 00    JURISDICTION BOUNDARY
```

FIGURE 4

PREEMPTED AND PUBLIC INSTITUTIONAL LAND MAP ROUND 1


84
86
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90
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94
96
98
100
102
104
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108
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112
114
116
118
12
14
16
18
20
22
24

PARCELS
MIDDLE NUMBER: % PREEMPTED LAND
BOTTOM NUMBER: % PUBLIC INSTITUTIONAL LAND

ROADS
.. .. ROADBED
-- II TYPE 1
== HH TYPE 2
ZZ WW TYPE 3
00 00 JURISDICTION BOUNDARY

TERMINALS
+ TYPE 1
X TYPE 2
* TYPE 3

and land which is undevelopable for local use because it is in such uses as a military base or airport.

The top number printed on the map includes both types of restrictions on development. The lower number is the percent of the parcel which is in public institutional use (golf courses, museums, etc.).

5. Demographic Map (See Figure 5)

This map shows the population (scaled in 100's) on each residential parcel in the simulated area and its percent occupancy. The quality index of a residence and the value ratio of a business are shown after depreciation but before maintenance is performed.

FIGURE 5

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........................................................................................

      DEMOGRAPHIC MAP                                                        ROUND  1
........................................................................................


  84   86   88   90   92   94   96   98  100  102  104  106  108  110  112  114  116  118
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.    .    .    .    0    .    .    .    .    .    . 67%. 83%H100%. 89 H 91 H100%I 75%. 67%.16
.    .    .    .    0    :    .    .    .    .    . 86 . 83 H 78 .    H    H 84 I 88 . 88 .
....................0..................................-----H==========+===H....I..........
.    .    .    .    0    :    .    .    .    .    . 10 . 20 H 30 .155 H250 .170 I 25 .    .
.    .    .    .    0    :    .    .    .    .    . 67%. 80%H100%. 96%H125%. 94%I 83%.    .18
.    .    .    .    0    .    .    .    .    .    . 95 . 94 H 84 . 51 H 48 . 58 I 66 .    .
....................0.......................................H.........H.........I........:.
.    .    .    .    0    :    .    .    .    .    .    . 20 H 30 .115 H 85 . 25 I 20 .    .
.    .    .    .    0    :    .    .    .    .    .    . 80%H100%. 96%H 94%.100%I100%.    .20
.    .    .    .    0    :    .    .    .    .    .    . 91 H 90 . 85 H 83 . 88 I 91 .    .
....................0.......................................H.........H.........I..........
.    .    .    .    0    :    .    .    .    .    . 15 . 20 H 30 .    H 25 . 20 I    .    .
.    .    .    .    0    .    .    .    .    .    .100%. 80%H100%. 85 H100%.100%I    .    .22
.    .    .    .    0    :    .    .    .    .    . 93 . 92 H 97 .    H 90 . 96 I    .    .
....................0....WZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZW---------I........:.
.    .    .    .    0    W    .    .    .    .    . 10 . 20 . 30 . 30 W    . 20 .    .    .
.    .    .    .    0    W    .    .    .    .    . 67%. 80%.100%.120%W 86 .100%.    .    .24
.    .    .    .    0    W    .    .    .    .    . 94 . 93 . 92 . 88 W    . 89 .    .    .
....................0....W............................................W..:...............:.

       PARCELS                                            ROADS                  TERMINALS
TOP:     POPULATION/100                           .. :.   ROADBED                 +  TYPE 1
MIDDLE:  % OCCUPANCY OR VALUE RATIO               -- II   TYPE 1                  X  TYPE 2
BOTTOM:  QUALITY INDEX (IF RESIDENCE)             == HH   TYPE 2                  .  TYPE 3
                                                  ZZ WW   TYPE 3
                                                  00 00   JURISDICTION BOUNDARY
```

B. Land and Building Value Maps

1. Auction Asking Price Map (Figure 6)

Economic and government teams may purchase or attempt to purchase land that is presently unowned (actually it is owned by small farmers and outside-the-system landowners whose interests are represented by the computer).

Teams may attempt to purchase land that is up for auction or make an unsolicited bid for an unowned parcel. Economic teams must purchase all the land on an unowned parcel that is not already owned by a government department or consumed by topographical constraints. Government departments (SC, MS, UT, HY, RAIL, and PZ) may purchase or attempt to purchase any amount of the unowned and unconstrained land that they wish in multiples of 4%. All private and public bids on unowned land ocst the bidder 2% of the offered price, whether the bid is successful or not.

Each round a number of parcels of unowned land are auctioned by the computer. The Auction Asking Price Map shows the market value of those parcels (in $1,000's). Each bid for an auctioned parcel of land is assigned a probability of success according to the curve in the figure below. Note that a bid that is 62% or more than the auction asking price has a 100% chance of being accepted. If several teams bid more than 62% of the asking price, but less than 100% of the asking price, the highest bid wins. In fact, all bids that are less than 100% of the asking price are considered by the computer in order of the highest bids first. If there are one or more bids that are 100% or more of the auction asking price, then the first bid submitted to the computer purchases the land.

2. Land Market Value Map (Figure 7)

The value of outside-owned parcels not up for auction can be estimated from the Land Market Value Map and the Auction Asking Price Map. The Land Market Value Map shows the total value (100%) of parcels owned by economic decision-makers. The value of an unowned parcel is affected by the value of surrounding parcels, the availability of roads, whether the parcel has utilities, and what the parcel's zoning classification is.

FIGURE 6

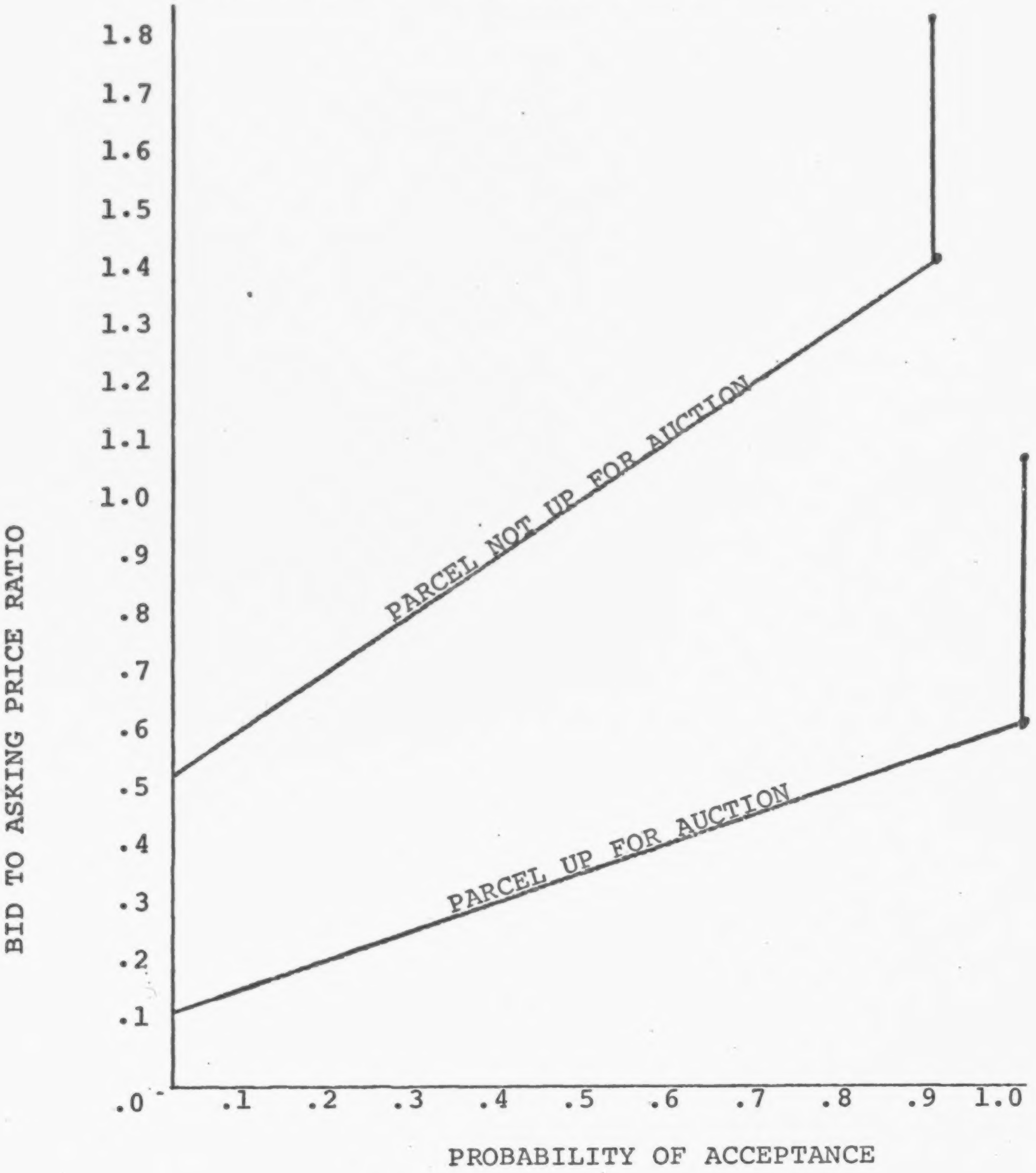
```
*********************************************************************************************
                                 TRI-CITY
                       AUCTION ASKING PRICE MAP        (IN $1,000'S)
*********************************************************************************************
      70    72    74    76    78    80    82    84    86    88    90    92    94    96    98   100   102
*********************************************************************************************
12 .   0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   .
14 .   0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   .
16 .   0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   .
18 .   0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   .
20 .   0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   .
22 .   0     0     0     0  8402     0     0     0     0     0     0     0     0     0     0     0     0
   .
24 .   0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   .
26 .   0     0     0     0     0     0     0     0     0     0     0     0     0     0     012241     0
   .
28 .   0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   .
30 .   0     0     0     0     0     0     0     0     0     0     0     0     0     0     010531     0
   .
32 .   0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   .
34 .   0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   .
36 .   0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   .
38 .   0     0     0     0     0     0     0     0  9680     0     0     0     0     0     0     0     0
   .
40 .   0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   .
42 .   0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   .
44 .   0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   .
```

FIGURE 7

```
**.*********************************************************************************************
                                          C I T Y   M O D E L      S A M P L E   O U T P U T
                               LAND MARKET VALUE MAP           (IN $100,000'S)
**.*********************************************************************************************
        70    72    74    76    78    80    82    84    86    88    90    92    94    96    98   100   102
... ............................................................................................
12 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   .
14 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   .
16 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   .
18 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   .
20 .     0     0     0     0     0     0     0     0     0     0     0     0    58    58     0     0     0
   .
22 .     0     0     0     0     0     0     0     0    35    35    35    35     3     3     6    12     0
   .
24 .     0     0     0     0     0     0     0     0    35    35    35     0     3    26    38    12    13
   .
26 .     0     0     0     0     0     0     0     0     0    10    10    12     7   714   179    26    10
   .
28 .     0     0     0     0     0     0     0     0     9    14     4    34   226   494   342    13     7
   .
30 .     0     0    98     0     0     0    81    18    20    44   101   119     0   624   104     7     7
   .
32 .     0     0     0     0     0     0    81    18    20    14    57    60   367   624    42    40    11
   .
34 .     0     0     0     0     0     0     0     0    13    10    18    60    60     0    54     0     0
   .
36 .     0     0     0     0     0     0     0     0     0    17     7    18    38    38    35     0     0
   .
38 .     0     0     0     0     0     0     0     0     0   165     3     4    11    14    10     0     0
   .
40 .     0     0     0     0     0     0     0     0     0     0     0     0    58    58     0     0     0
   .
42 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   .
44 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   .
46 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   .
48 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   .
50 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   .
52 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   .
54 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   .
56 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   .
58 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
   .
60 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
... ............................................................................................
```

Teams may make as many unsolicited bids as they wish in a round. Each unsolicited bid is assigned a probability of success according to the appropriate curve in the figure above. Note that no unsolicited bid can have more than a 90% chance of success despite the amount of the bid. Note also that when an unsolicited bid is equal to the market value of a parcel, there is a 50% chance of success.

RELATION BETWEEN THE PROBABILITY OF ACCEPTANCE AND THE RATIO OF BID TO ASKING PRICE



3. Development Market Value Map (Figure 8)

4. Total Market Value Map (Figure 9)

These maps indicate the market value of developments and the total market value (land plus developments) for a particular parcel. They should be used when purchasing or selling land and/or developments.

FIGURE 8

```
**.*************************************************************************************
                                        C I T Y   M O D E L      S A M P L E   O U T P U T
                              DEVELOPMENT MARKET VALUE MAP        (IN $100,000'S)
**.*************************************************************************************
        70   72   74   76   78   80   82   84   86   88   90   92   94   96   98  100  102
...  .........................................................................................
12 .     0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
   .
14 .     0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
   .
16 .     0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
   .
18 .     0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
   .
20 .     0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
   .
22 .     0    0    0    0    0    0    0    0    0    0    0    0    0    3   10   22    0
   .
24 .     0    0    0    0    0    0    0    0    0    5    0    0    3   36   54   21   24
   .
26 .     0    0    0    0    0    0    0    0    0   24   22   18    6 2040  450   24   18
   .
28 .     0    0    0    0    0    0    0    0   25   34    6   90  450  945 1140   10    9
   .
30 .     0    0    0    0    0    0    0   54   54  187  400  270    0  692  270   14   10
   .
32 .     0    0    0    0    0    0    0   54   54   15  144  200  510  840   80   34   14
   .
34 .     0    0    0    0    0    0    0    0   30   24   44  132  179    0  177    0    0
   .
36 .     0    0    0    0    0    0    0    0    0   40   16   48   96   96   96    0    0
   .
38 .     0    0    0    0    0    0    0    0    0    0    8    8   24   32   24    0    0
   .
40 .     0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
   .
42 .     0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
   .
44 .     0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
   .
46 .     0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
   .
48 .     0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
   .
50 .     0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
   .
52 .     0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
   .
54 .     0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
   .
56 .     0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
   .
58 .     0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
   .
60 .     0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
...  .........................................................................................
```

FIGURE 9

```
**.*************************************************************************************
                                        C I T Y   M O D E L      S A M P L E   O U T P U T
                           TOTAL MARKET VALUE        (IN $100,000'S)
**.*************************************************************************************
         70    72    74    76    78    80    82    84    86    88    90    92    94    96    98   100   102
... ......................................................................................
 12 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    .
 14 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    .
 16 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    .
 18 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    .
 20 .     0     0     0     0     0     0     0     0     0     0     0     0    58    58     0     0     0
    .
 22 .     0     0     0     0     0     0     0     0    35    35    35    35     3     6    16    34     0
    .
 24 .     0     0     0     0     0     0     0     0    35    40    35     0     6    62    92    33    37
    .
 26 .     0     0     0     0     0     0     0     0     0    34    32    30    13  2754   629    50    28
    .
 28 .     0     0     0     0     0     0     0     0    34    48    10   124   676  1459  1482    23    16
    .
 30 .     0     0    98     0     0     0    81    72    74   231   501   389     0  1516   374    21    17
    .
 32 .     0     0     0     0     0     0    81    72    74    29   201   260   877  1464   122    74    25
    .
 34 .     0     0     0     0     0     0     0     0    43    34    62   192   239     0   231     0     0
    .
 36 .     0     0     0     0     0     0     0     0     0    57    23    66   134   134   131     0     0
    .
 38 .     0     0     0     0     0     0     0     0     0   165    11    12    35    46    34     0     0
    .
 40 .     0     0     0     0     0     0     0     0     0     0     0     0    58    58     0     0     0
    .
 42 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    .
 44 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    .
 46 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    .
 48 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    .
 50 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    .
 52 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    .
 54 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    .
 56 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    .
 58 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    .
 60 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
... ......................................................................................
```

C. Employment Detail

1. Part-time Work Allocation (Figure 10)

This output indicates the location of all part-time employers (ADED means teachers for adult education), time units used (by employees), and salary offered. This information is given for each class.

2. Employment Selection Information (Figure 11)

This output gives the following information about population units living in the city: location of their residences; number of Pl's unemployed; employment location; number of Pl's working there; and the salary offered to each worker. Next the output indicates the amount of time spent travelling to and from work and the total costs of travel to work by the various modes. It also shows the route and mode of travel which these population units take to work. This is done by listing the intersections passed, where a new mode is used, or where travel stops. The route is traced from work to home. An intersection is a four or five digit number, which may be preceded by a bus or rail route number if the Pl got off the bus or rail system at that intersection.

3. Employment Summary (Figure 12)

This output summarizes the employment in the entire city. It shows employment by class and for all classes.

a. Number of Residences - the number of different locations at which a particular class lives in the city.

b. Pl's Employed at this Level - the number of population units employed in a job at their socio-economic class.

c. Pl's Employed at Lower Level - the number of population units employed in jobs below their socio-economic class.

d. Pl's Unemployed - the number of population units which are not employed.

e. Total Population Units - the total number of Pl's of the class on the board.

FIGURE 10

```
PART-TIME WORK ALLOCATION FOR HIGH   INCOME CLASS


 RESIDENCE  EMPLOYER     TIME UNITS  SALARY
 ------------------------------------------


   10418      ADED 2         20       10700
   10624      ADED 2         40       10700
   10622      ADED 2         40       10700
   10620      ADED 2         25       10700
   10620      ADED 3         15       10000
   11222       11224         50       10200
   11226       11224         30       10200
   11226      ADED 3         40       10000
   11012      ADED 3         20       10000
   11012       11248         10       10500
   11616       11248         30       10500
   10646       11248         20       10500
   10648       11248         20       10500
   10650       11248         20       10500
    7256        7442         10        9400
   11614       11248         30       10500
   10852       11248         30       10500
   10852       11054         10       10000
    7254        7442         10        9400
   10416       11250         20       10000
   11246       11250         30       10000
    7052        7442         20        9400
    7252        7442         30        9400
    7654        7442         10        9400
   11220       11250         30       10000
   11220       11054         70       10000
```

FIGURE 11

```
                         EMPLOYMENT SELECTION INFORMATION FOR HIGH   INCOME CLASS

RESIDENCE  EMPLOYER   POPUL.  SALARY  TIME  AUTO  BUS   RAIL   ROUTE
LOCATION   LOCATION   UNITS           UNITS COST  COST  COST


 11012    UNEMPLOYED    0

            11216       3     10400     2   260    0     0      11115   11113


 11212    UNEMPLOYED    0

            11216       3     10400     2   260    0     0      11115   11113


 10814    UNEMPLOYED    0

            11254       5     10000    27   410    0   330      11155 20211119     11197     10917


 11014    UNEMPLOYED    0

             7444       6      9600    37  1570    0     0       7343     7341      7339      7337
                                                                  8137     8337      8537      8737
                                                                  8931     9131      9331      9329
                                                                  9523     9723      9923     10123


 11214    UNEMPLOYED    0

            11056       6     10000    23   310    0   330      11155 20211119     11117     11115


 11414    UNEMPLOYED    0

            11250       3     10000    19     0    0   320      11149 20211515
```

FIGURE 12

EMPLOYMENT SUMMARY

	LOW INCOME	MIDDLE INCOME	HIGH INCOME	ALL CLASSES
NUMBER OF RESIDENCES	9	26	93	114
PT'S EMPLOYED AT THIS LEVEL	184	324	374	882
PT'S EMPLOYED AT LOWER LEVEL	0	107	59	166
PT'S UNEMPLOYED	149	3	0	152
TOTAL POPULATION UNITS	333	434	433	1200
PART-TIME UNITS WORKED	1280	1455	680	3415
NUMBER OF JOBS STILL AVAILABLE	0	0	0	0

f. Part-Time Units Worked - the total number of part-time units worked by the class.

g. Number of Jobs Still Available - the number of unfilled jobs available to each class.

D. Commercial Detail

The commercial diagnostics print in the following order:

Personal Goods Allocation Summary
Personal Goods Allocation Maps

Personal Services Allocation Summary
Personal Services Allocation Maps

Business Goods Allocation Summary
Business Goods Allocation Map
Business Goods Government Contracts Allocation

Business Services Allocation Summary
Business Services Allocation Map
Business Services Government Contracts Allocation Summary

Terminal Allocation Summary
Terminal Allocation Map

1. Personal Goods Allocation Summary (Figure 13) (This explanation applies to PS also.)

This tabular summary provides detail on where people are buying their goods aor normal consumption and recreation and where residences are buying their goods for maintenance. The first section of the summary applies to the PG's. It lists the code number of each PG, the last one being the code number for the Outside system. The location, owner, level, effective capacity, capacity used, price per unit, and gross income of each PG is given. Outside has no owner, level or effective capacity (the capacity is infinite). Its price per unit is always $13,000.

The second section provides detail on all purchasers of personal goods. The first item of information is the code number of the PG at which the purchaser is buying. The list is ordered by the code numbers of the PG's, so those purchasing from the Outside are last on the list. The location of the buyer, its class or residence type, the social decision-maker controlling the class or the economic decision-maker controlling the residence, the number of units consumed, the transportation cost, the purchase cost, and the total cost are given. The transportation cost printed for a residence is a dummy cost used for allocation

FIGURE 13

```
*************************************************************************************************
                    TRI-CITY
          PERSONAL GOODS  ALLOCATION SUMMARY
*************************************************************************************************


                                          PERSONAL GOODS
                                          --------------

      NUMBER      LOCATION     OWNER     LEVEL     CAPACITY      CAPACITY USED      PRICE/BU      GROSS INCOME
      ------      --------     -----     -----     --------      -------------      --------      ------------

         1          11022        H         1         13680           10352            10400         107660800.

         2           7446        D         1         12000           11780             9300         109554000.

         3          11050        D         1         13600           13832            10000         136320000.

         4               OUTSIDE                                         0            13000                0.

                                                     TOTAL           35764                          353534800.


                                 CUSTOMERS
                                 ---------

  PERSONAL GOODS                 CLASS OR     DECISION MAKER CONSUMPTION       TRANSPORTATION    PURCHASE     TOTAL
  ASSIGNED TO      LOCATION      LAND USE      CONTROLLING       UNITS              COST           COST        COST
  --------------   --------      --------     -------------- -----------       --------------    --------     -----


       1             11012          RA              B               2                  896.        20800.     21696.

       1             11012          HIGH            A             105                47040.      1092000.   1139040.

       1             11212          RA              A               5                 2240.        52000.     54240.

       1             11212          HIGH            F             102                45696.      1060800.   1106496.

       1             10814          RA              D               4                 2048.        41600.     43648.

       1             10814          HIGH            I             182                93184.      1892800.   1985984.

       1             11014          RA              H               8                 2816.        83200.     86016.

       1             11014          HIGH            A             204                71808.      2121600.   2193408.
```

purposes only; it is never paid by the residence.

2. Business Goods Allocation Summary (this applies to Business Services also).

The explanation for the PG-PS summary applies to this summary with three exceptions. The Outside price per unit is $130,000, only businesses buy BG or BS, and the number of units consumed by a customer includes goods needed for normal operation plus goods needed for maintenance.

3. PG, PS, BG, BS Allocation Maps (Figure 14)

The location of each of the businesses of the type for which the map is being printed has the code number of the establishment and is bordered by asterisks. The location of each buyer has the code number of the establishment from which it is buying. PG and PS have separate maps for each class of customer and one for residences.

4. Business Goods Government Contracts (Figure 15) (This applies to Business Services also).

The MS and School Departments in each jurisdiction may contract with BG and BS for their goods and services purchases. Whatever amount they do not contract for is purchased from the Outside at Outside prices. The Government Contracts table lists the code number of the BG from which the government department is buying, the department and jurisdiction, the number of consumption units purchased, and the total cost of the purchase.

5. Terminal Allocation (Figure 16)

There are two sections to the terminal diagnostics. The first gives the location of each terminal user, its land use (LI, HI, or BG), and the number of terminal consumption units used. The code number, location and level of each terminal is also given. The second section is a map identical in format and purpose to the commercial allocation maps.

FIGURE 14

PERSONAL GOODS ALLOCATION MAP HIGH CLASS

	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	1	1	1	1	* 1*	0	0	0	0	0
32	0	0	0	0	0	0	0	1	1	2	2	2	0	0	0	0	0
34	0	0	0	0	0	0	0	0	1	1	2	2	2	0	1	0	0
36	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0
38	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102

FIGURE 15

		GOVERNMENT CONTRACTS	
BUSINESS GOODS	DEPARTMENT	CONSUMPTION UNITS	COST
1	MS1	13	1300000.
2	MS1	15	1950000.
1	SC1	16	1600000.
2	SC1	12	1560000.
1	MS2	20	2000000.
2	MS2	15	1950000.
1	SC2	30	3000000.

FIGURE 16

```
CUSTOMERS

 LOCATIONS  LAND USE  REQUIREMENTS

   11016       LI          1000
   11216       LI          1000
    7242       HI          6000
    7442       BG          2178
    7444       HI          3000
    7452       LI          1000
   11054       BG          3180
   11254       LI          2000
   11654       LI          1000
   11056       HI          3000
   11256       HI          3000

TERMINALS

NUMBER  LOCATION  LEVEL

  1        7343     2
  2       11117     1
  3       11155     2
```

E. Migration Detail

1. Migration Statistics (Figure 17)

By class and by jurisdiction, this output lists in Pl's the number of in-migrants from Outside, from other jurisdictions and from natural growth, the number who migrated to Outside, to other jurisdictions, and within jurisdictions.

2. Final Population (Figure 18)

This output prints the final number of Pl's in each class living in each jurisdiction.

FIGURE 17

```
MIGRATION STATISTICS--VERSION B

IN-MIGRATION FROM OUTSIDE SYSTEM

  JURIS          PL          PM          PH
   1              22          11          9
   2               0           0          0
   3               0           0          0


IN-MIGRANTS FROM OTHER JURISDICTIONS

  JURIS          PL          PM          PH
   1               0           0          0
   2               0           0          0
   3               0           0          0


NATURAL POPULATION GROWTH

  JURIS          PL          PM          PH
   1               1           1          1
   2               0           0          0
   3               0           0          0


OUT-MIGRATION TO OUTSIDE SYSTEM

  JURIS          PL          PM          PH
   1               4           2          6
   2               0           0          0
   3               0           0          0

OUT-MIGRATION TO OTHER JURISDICTIONS

  JURIS          PL          PM          PH
   1               0           0          0
   2               0           0          0
   3               0           0          0

MIGRATION WITHIN JURISDICTIONS

  JURIS          PL          PM          PH
   1               7           2          1
   2               0           0          0
   3               0           0          0
```

FIGURE 18

FINAL POPULATIONS

JURIS	PL	PM	PH
1	152	201	212
2	0	0	0
3	0	0	0

TOTAL = 565 P1'S

F. Summary Information

Demographic and Economic Statistics (Figure 19)

This output summarizes a wide variety of information for the simulated area. It includes statistics on population, developed and undeveloped land, assessed value of land and developments, dissatisfaction levels, total registered voters, population units, public adult education, average educational level, welfare, student/teacher ratio, school enrollment, housing, employment, income and jobs. A final section "transactions with the National Economy" summarizes income from and expenditures to the outside system and indicates the condition of the National Economy Business Cycle. (Note: The gross income rate of an industry indicates the ratio of its present income to the typical income.)

FIGURE 19

```
**.********************************************************************************************************************
        C I T Y   M O D E L      S A M P L E   O U T P U T
          DEMOGRAPHIC AND ECONOMIC STATISTICS                                                           ROUND  3
**.********************************************************************************************************************

                                                                       JURISDICTION   JURISDICTION   JURISDICTION
                                                     TOTAL                  I              II             III
  *************************************         **********            **********     **********     **********

  TOTAL POPULATION                                299500                144000         155500              0
                      LOW    CLASS                 77500                  5000          72500              0
                      MIDDLE CLASS                108500                 70000          38500              0
                      HIGH   CLASS                113500                 69000          44500              0


  PERCENT CHANGE OVER PREVIOUS YEAR                    6
  POPULATION PER SQUARE MILE                         479                   486            472              0
  POPULATION PER RESIDENTIAL SQUARE MILE            2094                  1694           2320              0

  DEVELOPED   LAND (IN SQ. MILES)                     43                    18             25              0
  UNDEVELOPED LAND                                   582                   278            304              0
  TOTAL LAND AREA                                    625                   296            329              0

  TOTAL ASSESSED VALUE OF LAND                      775.                  166.           609.             0.
                             IN MILLIONS
  TOTAL ASSESSED VALUE OF DEVELOPMENTS             1186.                  241.           945.             0.
                             IN MILLIONS

  AVERAGE DISSATISFACTION LEVEL                       83                    58            105              0
  NUMBER OF REGISTERED VOTERS                      96885                 51550          45335              0
  NO. IN PUBLIC ADULT EDUCATION                    65720                 24400          41320              0

  AVERAGE EDUCATIONAL LEVEL                           59                    72             47              0
       LOW                                            13                    13             13              0
       MIDDLE                                         66                    66             66              0
       HIGH                                           83                    82             84              0


  NO. OF WORKERS RECEIVING WELFARE                  1600                     0           1600              0

  STUDENT/TEACHER RATIO                               11                    12             10              0

  SCHOOL ENROLLMENT
       PUBLIC                                      60960                 31520          29440              0
       PRIVATE                                     14430                  7020           7410              0

  HOUSING UNITS
       SINGLE    DWELLINGS                           114                    65             49              0
       MULTIPLE  DWELLINGS                            23                     7             16              0
       HIGH RISE APARTMENTS                            6                     4              2              0

  VACANCY RATE        (PERCENT)                       -2                    17            -23              0
       NEGATIVE MEANS OVERCROWDED




  NUMBER OF EXPECTED WORKERS                       91360                 40960          50400              0
       LOW                                         29400                  2000          27400              0
       MIDDLE                                      34720                 22400          12320              0
       HIGH                                        27240                 16560          10680              0



  NUMBER EMPLOYED IN
       HEAVY     INDUSTRY                          17280                  6120          11160              0
       LIGHT     INDUSTRY                          26880                 13640          13240              0
       NATIONAL  SERVICES                          11760                  5240           6520              0
       CONSTRUCTION INDUSTRY                        1440                   520            920              0
       BUSINESS  GOODS                              3600                  2480           1120              0
       BUSINESS  SERVICES                           5640                   480           5160              0
       PERSONAL  GOODS                              7440                  3040           4400              0
       PERSONAL  SERVICES                           5680                  3320           2360              0
       MUNICIPAL SERVICES                           5280                  4160           1120              0
       SCHOOLS                                      5880                  1960           3920              0
       RAIL                                          160                     0            160              0
       BUS                                           320                     0            320              0

  NUMBER OF UNEMPLOYED WORKERS                      1600                     0           1600              0
       LOW                                          1600                     0           1600              0
       MIDDLE                                          0                     0              0              0
       HIGH                                            0                     0              0              0


  UNEMPLOYMENT RATE    (PERCENT)                    1.72                   .00           3.08            .00
       LOW                                          5.16                   .00           5.52            .00
       MIDDLE                                        .00                   .00            .00            .00
       HIGH                                          .00                   .00            .00            .00


  PERCENT EARNING      UNDER $ 3,000                  32                     4             54              0
  PERCENT EARNING $3,000 TO $10,000                   38                    54             24              0
  PERCENT EARNING      OVER $10,000                   29                    40             21              0


  ESTIMATED NUMBER OF NEW JOBS                         0                     0              0              0
                      LOW                              0                     0              0              0
                      MIDDLE                           0                     0              0              0
                      HIGH                             0                     0              0              0
```

G. Economic Decision-Maker Output

Each of the economic teams receives summary statistics at the beginning of every round of play that describe the cash flow for the previous year, a balance sheet showing net worth, loans made and received, construction in progress, boycotts in operation, and undeveloped land holdings. The team may use any of its resources to achieve whatever objectives it desires.

1. Financial Summary (Figure 20)

a. Cash Flow Statement

A team's cash holdings can be used to purchase additional property, construct any of the eleven types of land uses on property that it owns and which is properly zoned and served with utilities, demolish any building it owns, pay off loans, grant a loan to another team, pay taxes on undeveloped land, or spend it in some miscellaneous way (cash transfer to another team and purchase of national stocks).

Additions to the new balance (i.e., cash) come from income derived by selling property, receiving payment from loans, receiving loans, earning net income from investment (developments) in the local economy, receiving government subsidies, earning interest on savings, and from miscellaneous sources (cash transfers from others and sale of national stocks).

If the team makes no decisions during a particular round, it is still charged interest and principal payments on loans and taxes on undeveloped land. The team also automatically receives loan payments, interest on savings, and net income. This latter figure, however, may be a negative number if the developments of a given team are doing poor business and expenses exceed income.

b. Investments

The second part of the financial summary output shows investments in the national economy. A team may invest as much cash as it wishes in either conservative or speculative national businesses. The national business cycle generates the year by year rate of return for conservative stocks and for speculative stocks. In upswings in the business cycle, the rate of return on speculative stocks will always be larger. The range for the rate of return on conservative stocks is 5% to 7%, and for speculative stocks it is -1% to 10%. The return from national

FIGURE 20

```
*************************************************************************
        TRI-CITY
      FINANCIAL SUMMARY--ECONOMIC DECISION MAKER A
*************************************************************************

 CASH FLOW STATEMENT
 -------------------


   PREVIOUS CASH BALANCE                        $      30000000


      EXPENDITURE
           PROPERTY PURCHASED                   $             0
           CONSTRUCTION                         $             0
           DEMOLITION                           $             0
           LOAN PAYMENTS                        $      29389450
           NEW LOANS GRANTED                    $             0
           UNDEVELOPED LAND TAXES               $       2954050
           MISCELLANEOUS                        $             0


      INCOME
           PROPERTY SOLD                        $             0
           LOAN PAYMENTS RECEIVED               $             0
           LOANS RECEIVED                       $             0
           TOTAL NET INCOME                     $      98301566
           SUBSIDIES                            $             0
           INTEREST ON SAVINGS                  $       2398951
           MISCELLANEOUS                        $             0


      NEW BALANCE                               $      98357017


           CONSERVATIVE INVESTMENTS               $               0
                INCLUDING A RETURN OF   $                  0


           SPECULATIVE INVESTMENTS                $               0
                INCLUDING A RETURN OF   $                  0



   ASSETS
      CURRENT
           CASH                                 $      98357017
           LOANS TO OTHERS                      $             0
           INVESTMENTS IN OUTSIDE               $             0
           DEVELOPMENTS                         $     135170000
           LAND                                 $     713087200
        TOTAL                                   $     946614217


   LIABILITIES
           INDEBTEDNESS                         $     334131424
        NET WORTH                               $     612482793
```

investments is automatically used to purchase additional stock. A team must "dis-invest" in order to transfer funds from the outside investment.

c. Balance Sheet

Current assets for a team are comprised of cash on hand, loans to others, the value of investments in the national economy, and the value of developments and land. Developments are valued at their typical construction costs times their value ratio divided by 100. Thus, developments that are not maintained decrease in value over time. Land is valued at the fair market value.

Current liabilities is the sum of the principal on all loans from others (indebtedness). Net worth is the difference between current assets and liabilities. Teams may borrow up to 80% of their total assets from national bankers. There are no limits on the amount of debt that teams may have among themselves.

2. Loan Statement (Figure 21)

The loans that a team has with national bankers (outside = OU) and with other teams are shown in the loan statement. The loans received from other sources are listed and their annual payments summarized, and the loans granted to other teams are listed second. Note that the interest rate may vary by loan.

Loans between teams are made for any amount and at whatever interest rate that is mutually agreeable. The only conditions on a loan internal to the system is that the period be specified as either 2 or 25 years, and that the lending team have sufficient cash to cover the loan.

An economic team may also borrow money from the outside system for either a 2 or 25 year period. The interest rate is set by the national bankers who take into consideration the national business cycle. An economic team that has debts equalling 80% of its total assets may not receive any further loans from the outside system.

3. Land Summary (Figure 22)

The land summary output shows the location by parcel coordinates of all land owned by a team. It also shows the assessed value of the parcel (assuming that 100% of the parcel is valued in the same proportion as the private part),

FIGURE 21

```
.***************************************************************************************************
        C I T Y   M O D E L      S A M P L E   O U T P U T
      LOAN STATEMENT--ECONOMIC DECISION MAKER  A
.***************************************************************************************************

                                    INTEREST         REMAINING         ORIGINAL          ANNUAL
BORROWER             LENDER         RATE             YEARS             PRINCIPAL         PAYMENT
--------             ------         --------         ---------         ---------         -------

   A                   UU              3.5              22            $  75000000       $  4550552
                                                                                        ---------
                                                                          TOTAL         $  4550552
```

FIGURE 22

```
*******************************************************************************************************************
             C I T Y   M O D E L      S A M P L E   O U T P U T
             LAND SUMMARY--ECONOMIC DECISION MAKER  A                                                     ROUND  3
*******************************************************************************************************************


                           PRIVATELY OWNED                        PUBLICLY OWNED
                        ----------------------------            ----------------------
                ASSESSED                        TAXES ON                                                                     UTILITY    CAPACITY
LOCATION           VALUE   %UNDEVELOPED      UNDEV. LAND        %DEVELOPED  %UNDEVELOPED    %UNDEVELOPABLE   CAPACITY        USED
--------        --------   ------------      -----------        ----------  ------------    --------------   --------    --------


 118-18     $  4410000              100   $      154350                 0             0                 0          0           0
 116-18     $  4170000              100   $      145950                 0             0                 0          0           0
  80-22     $  1750000               88   $       60800                 8             4                 0        100           0
  90-22     $   140000               64   $        3150                24             0                 0        100           4
  86-26     $   490000               56   $       10800                 8             0                 0        100          12
  90-26     $  5570000               60   $      112770                20             0                 0        200          76
 102-26     $   490000               56   $        9450                 8             0                 0        100          12
 110-26     $  2690000               88   $       68900                 8             0                 0        100           0
  90-30     $  5050000                8   $       16000                68             0                 0        300         234
 102-30     $   370000               52   $        6650                24             0                 0        100           8
  80-32     $   960000                0   $           0                28             0                 0        100          24
 100-32     $  2020000               72   $       50750                16             0                 0        100          26
 106-32     $  4040000               64   $       90650                36             0                 0        100           0
  90-34     $        0               64   $           0                36             0                 0          0           0
  94-36     $  1690000                4   $        2800                72             0                 0        200          52
  92-38     $   160000               28   $        1750                60             0                 0        100           4
```

the publicly owned part (percent developed and undeveloped), the undevelopable percent, the number of units of utility service available to that parcel, and the actual amount of utility units that are used.

Teams may acquire land from other players at mutually agreeable terms or from the computer on a bid submission basis. The computer represents small farmers and outside land holders who will sell if the price is right. A team's bid will not be processed if it is less than the fair market value of the land. An approximation of fair market value for computer owned land can be made from the Fair Market Value Map. The factors that affect the market value of a parcel of land are the location with respect to terminals and residences, the zoning, highway access, and utility service.

The cost of making land bids on computer-owned properties is 2% of the bid amount, regardless of the bid's success or failure.

4. New Construction Table (Figure 23)

The new construction output shows for an economic decision-maker the location at which a new development or an additional level of development is taking place. It also shows the type of development, the old and new level, the location of the local construction industry or 0-0 denoting an outside firm, the contract price, the rent per PL1(if a residence) or the salary by class (if an employer), the quality index (if housing) or the price per CU (if a store), and the status. "Pending" means that the development will become operational the next round. "Deferred" means that the CI does not have the building capacity to finish on schedule so that the development will not become operational in the next round but at whatever date the CI finishes the job. Deferred contracts have priority next round. "Completed" means that the development became operational at the beginning of the round just completed.

5. Economic Boycott (Figure 24)

Economic teams may boycott the purchase of goods or services from local BG, BS, PG, and/or PS establishments, and their businesses can be boycotted by the social sector as a place to work or shop. Boycotts have effect for the full round, and they continue in operation for succeeding rounds unless terminated by a decision input on the part of the boycotting team. The boycott output shows the team boycotting,

FIGURE 23

```
**.*****************************************************************************************************************
          C I T Y  M O D E L     S A M P L E   O U T P U T
                NEW CONSTRUCTION TABLE   - TEAM D                                                          ROUND  3
**.*****************************************************************************************************************

                                                                             RENT/PL1     QUALITY INDEX
               LAND      OLD      NEW      CONSTRUCTION        AGREED          OR              OR
 LOCATION      USE      LEVEL    LEVEL       LOCATION           PRICE        SALARIES      PRICE/CU            STATUS

  100-50        RA        2        4           0- 0         $ 1820000        $140000          40              COMPLETED
```

FIGURE 24

```
**.*****************************************************************************
        C I T Y   M O D E L        S A M P L E   O U T P U T
     ECONOMIC DECISION MAKER A   BOYCOTT STATUS OUTPUT
**.*****************************************************************************


                  BOYCOTTING                                   BOYCOTTED
                  ----------                                   ---------
             CLASS OR
    TEAM     LAND USE     FUNCTION          LOCATION     LAND USE     OWNER
    ----     --------     --------          --------     --------     -----

     A         NS           SHOP              9632          BS          B
```

the income class or land use that is carrying out the boycott, and the function being boycotted (work or shop). The boycott output also shows the location and land use being boycotted, and the team owning the boycotted business.

Thus, boycott information appears as part of an economic decision-maker's output if he is doing the boycotting and/or if he is being boycotted.

6. Residence Detail (Figure 25)

The residence output shows the location, type and level of each residential complex owned by a team. All residences in the model are described as rental units, although the rent on single family housing could be viewed as a form of mortgage payment. Although the construction and operation of housing is a player decision, the process that moves population units into housing is performed by the computer and is affected by player decisions in the economic and governmental sectors.

The economic decision-maker directly controls the quality index of housing (by changing the maintenance level) and the rent. Government decision-makers affect the quality of municipal services and schools serving each residence and the tax rate and welfare rate for the jurisdiction containing each residence. All of these factors are taken into consideration by the computer when assigning population units to available housing.

a. The Quality Index and Maintenance Level

The quality index of a residence is a measure of the present value of a development to the best possible value which a residence can have. The social sector master table (page 231) shows that PH's require a quality index of at least 70, PM's a value of 40, and PL's a value of 20. This does not mean, however, that all Pl's of a given class automatically move out of housing when the quality index falls below the minimum value. They just won't move in, and they tend to move out because of increased dissatisfaction.

The quality index declines each year in response to time and the quality of local municipal services, unless maintenance is performed on the residence. The maintenance level indicates the lowest level the owner of the residence will allow the quality index to fall before incurring maintenance expenses. The quality index can be raised above its present level by the player inputting a maintenance level that is higher than the quality index. The quality

FIGURE 25

25

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**************************************************************************************
                         TRI-CITY
              ECONOMIC  DECISION MAKER  E  RESIDENCE OUTPUT
**************************************************************************************

LOCATION                       7240          10846          11246          10448
TYPE AND LEVEL                  RB3            RA3            RA4            RA1
QUALITY INDEX                    70             88             86             90
MAINTENANCE LEVEL                70             88             85             90
MS SERVING                        1              5              5              5
MS USE INDEX                    233            139            139            139
OCCUPANTS                   13M  9H         0M  3H         0M  3H         0M  1H
PERCENT OCCUPANCY                98            100             75            100
RENT PER PL1                 149000         160000         157000         161000

INCOME
     RENT                   5264666         960000         942000         322000

EXPENDITURES
     MAINTENANCE              84000              0              0              0
     UTILITIES               780000         120000         160000          40000
     PROPERTY TAXES          355050          69150         128800          18900
     INCOME TAXES           2038742         383550         324019         126629
     SALES TAX                 3636              0              0              0
NET INCOME                  2003238         387300         329181         136471
```

index may not be raised more than 20 points above the lowest level it has ever reached.

b. MS Serving and MS Use Index

As was mentioned above, the quality of the municipal services (as measured by the MS use index) serving a residence has an effect on the attractiveness of that residence to potential Pl occupants and on the rate of depreciation (decline in quality index) for that residence. The residence output shows the number of the municipal service building that serves each residence and the use index of that municipal service building. An index value of 101 or more indicates overcapacity and means that the municipal services supplied are less than adequate. As the MS use index increases above 101, the residences served by that MS building become less and less attractive to Pl's and the residences also depreciate at a faster and faster rate. For example, a use index of 150 is twice as bad as a use index of 125 and five times as bad as a use index of 110.

c. Occupants, Percent Occupancy, and Rent

The residence output shows the number of Pl's of each class that occupy every residence. PH's and PL's may never live together on the same residence parcel. The percent of occupancy is determined by taking the number of Pl's by class, multiplying times their residence space consumption index (Social Sector Master Table), and taking this as a ratio of the total space units in the residence. For example, assume an RA3 has one PH and two PM's occupying it. The PH has a space consumption index of 2 and the two PM's together a space consumption index of 2.66 (2 x 1.33). Thus, there are 4.66 space units being occupied from an RA3 that has 6.00 space units of capacity. The occupancy rate is therefore 4.66/6 = .78, or the building is 78 percent occupied.

Rents are always specified in terms of the rent paid per PL unit, which is equivalent to a space unit. A PM pays 1.33 times the per space unit rent, and a PH pays twice as much.

d. Income

The income earned by a residential unit is equal to the rent per space unit times the total number of space units occupied. In the above example, 4.66 space units were occupied therefore, at a rent of $150,000 per space unit (per PL) the rental income would be $699,000.

e. Expenditures

The owners of residences incur expenditures for maintenance, utilities, property taxes, income taxes, and sales taxes. The amount of money spent on maintenance is the product of the percent of maintenance times the original value of the building. Assume that the RA3 mentioned above depreciates in value 3% and that the maintenance level was specified such as to offset any depreciation. The cost of maintenance would therefore be .03 x $3,000,000 (the original value of the RA3) = $90,000.

The expenditure for utilities depends upon the number of utility units consumed by type and level of residence (see the Economic Master Table) and the cost per unit of utility service as established by the Utility Department. The typical cost of utility service is $10,000 per unit, and an RA3 consumes 12 units per year, so its utility cost would be $120,000.

Residences pay property tax on the assessed value of the building and the land occupied by the building The Assessment Department has control over land and building assessments and the Chairman and Council have control over the tax rates which are applied to the assessed value.

Residences pay income taxes on the same basis as all other economic businesses -- a federal tax of 22% on the first $25,000 of net income before taxes and of 48% on the rest of net income and a state tax of 5% on net income (after federal income taxes).

Residences pay sales taxes on the purchases from PG and PS for maintenance. The fixed state sales tax is 3% of PG and PS purchases and the local sales tax is whatever rate has been determined by the local sales tax authorities. Sales taxes accrue to the jurisdiction of the commercial establishment and not to the jurisdiction of the residence. State sales taxes are paid on purchases from the outside system as well as from local purchases.

f. Net Income

The final net income for residences is determined by subtracting all of the listed expenditures from the income derived through rents. The net income figure can be compared with the value of the residences and the land they consume to arrive at an estimate of the annual rate of return.

7. Basic Industry Detail (Figure 26)

The basic industry output shows the location, type and level of each basic industry (HI, LI and NS) owned by a team. Basic industry produces units of output that are sold at national markets for per unit prices that are determined by the national business cycle. Owners of basic industry should consult the section of the Demographic and Economic Statistics that show the status of the national economy business cycle.

Basic industry has some characteristics in common with all of the other economic developments. Hence, some of these characteristics have already been described under the residence heading. Other characteristics are peculiar to businesses or to basic industry as the following will indicate.

a. Value Ratio and Maintenance Level

Whereas residence quality is represented by the quality index, businesses have their quality represented by the value ratio. The value ratio is the ratio of present value to original value. Businesses depreciate every year in response to time and MS service quality. The Economic Master Table shows the annual percent depreciation caused by time and by MS quality. The way that businesses may overcome this depreciation effect is to set the maintenance level at a point below which they do not want the value ratio to fall. For example, if the maintenance level is set at 100, then the business will make maintenance expenditures every year to keep the building in "like new" shape. The value ratio of a business may be raised above its present value (if less than 100) by inputting a maintenance level that is higher than the value ratio.

b. MS Serving and MS Use Index

As for residences, the value ratio of basic industry is lowered by poor municipal services as measured by an MS use index in excess of 100. Basic industry output shows the number of the municipal service building which serves the basic industry and the use index of the building. The contribution of the MS use index to value ratio decline is directly proportional to the amount by which the use index exceeds 100. For example, a use index of 150 has double the effect of a use index of 125 and five times the effect of a use index of 110.

FIGURE 26

```
****************************************************************
          TRI-CITY
  ECONOMIC  DECISION MAKFR  F   BUSINESS OUTPUT
****************************************************************

                       BUSINESS DETAIL OUTPUT
                                 NS

              LOCATION                        11248
              TYPE AND LEVEL                    NS2
              VALUE RATIO                        92
              MAINTENANCE LEVEL                  92
              MS SERVING                          5
              MS USE INDEX                      139
              SALARY (PER WORKER)
                  HIGH                          105
                  MIDDLE                         50
                  LOW                            25
              EMPLOYEES
                FULL TIME (IN PYS)
                  HIGH                           46
                  MIDDLE                         18
                  LOW                            18
                PART TIME (IN UNITS)
                  HIGH                          160
                  LOW                             0
              EMPLOYMENT EFFECT                2000
              UNITS PRODUCED                   1840
              PRICE/UNIT OUTPUT              115499
              INCOME
                  SALES(PRIVATE)          212518160
              EXPENDITURES
                 GOODS                     12000000
                 SERVICES                  46000000
                 MAINTENANCE                3000000
                 UTILITIES                  1520000
                 TRANSPORTATION
                    TO GOODS                 189504
                    TO SERVICES              247808
                 SALARIES
                  HIGH                     60480000
                  MIDDLE                   14400000
                  LOW                       9000000
                 PROPERTY TAXES             2150000
                 SALES TAXES                3355000
                 INCOME TAXES              30442479
              NFT INCOME                   29733369
```

c. Salary

All businesses must hire employees in order to operate and earn income. Employees' salaries are expressed in terms of wage per worker and not per P1. The normal salary levels are $10,000 for PH, $5,000 for PM, and $2,500 for PL. Since the number of population units hired by an employer is determined by the employment process which takes into account location, transportation, educational level of workers, salary offered and supply of and demand for workers, it is important that employers understand the local labor market situation before setting salary levels.

d. Employees and Employment Effect

The number of population units required for a level one development of all businesses is shown in the Economic Master Table. The number actually hired is shown on the detail business output. Full-time employees are shown in population units (P1's) and part-time employees are shown in time units, where 80 time units equal a P1.

If a basic industry hires all of the employees it requires, the employment effect is 1000 per level of development. A value of less than 1000 means that either some of the full or some of the part-time employees required from some income class were not hired. It is useful to check the Employment Summary and the Part-time Employment Statistics if deficiency of employees exists. If a basic industry at level one hires only 80 percent of the P1's it requires, then the employment effect is 800 (i.e., 1000 x .80).

e. Units Produced

The maximum units produced by a basic industry is 1000 per level. If the employment effect is less than 1000 and if the value ratio is less than 100 then the units produced will not be at a maximum. The units produced figure is obtained by multiplying the employment effect by VR/100. Thus, if the employment effect were 800 and the value ratio were 90, then the units produced would be 720 (i.e., 800 x .90).

f. Price per Unit of Output and Income

The price per unit of output for basic industry is determined by the national business cycle, and the normal price per unit for the industry type. The actual price per unit of output is the normal price multiplied by the business cycle factor. Income is the product of the price per unit and the units produced. All sales of basic industry output are to the national system.

g. Expenditures

Basic industry incurs expenses for business goods and business services. A fixed amount of BG and BS units are purchased by basic industry by type and level for normal operation. Basic industry also purchases BG and BS units in direct proportion to the amount of maintenance performed, and these expenditures are listed separately under the maintenance category.

The expenditure for utilities depends upon the number of utility units consumed by basic industry by type and level (see the Economic Master Table) and price per utility unit being charged by the Utility Department. Typical utility prices are $10,000 per unit. At these prices, an HI1 would spend $4,020,000 on utilities per year.

Basic industry pays transportation to BG and BS if the industry purchases these from the local system. The transportation charges are based on the type and level of industry and the least cost distances along the various types of roads. HI and LI also incur transportation costs to the terminal which represents the cost of shipping the units produced to national markets. The transportation costs to BG, BS, and the terminal are independent of the number of units purchased or produced. The costs are solely a function of type of industry, level, distance travelled to destination and type of roads.

Salary costs by class are determined by multiplying the salary per worker times the number of workers per P1 times the number of P1's hired. The normal salaries are $1,200,000 for a PH1, $800,000 for a PM1, and $500,000 for a PL1, since the three classes of population have 120, 160 and 200 workers respectively per P1.

Businesses pay property tax on the assessed value of the development and the land occupied by the development. The Assessment Department assesses the value of land and developments and the Chairman and Council determine the tax rates to be applied to the assessed values of developments and of land.

Businesses pay income taxes in the same manner as residences -- a federal tax of 22% on the first $25,000 of net income before taxes, a federal tax of 48% on the remainder and a state tax of 5% on net income after federal taxes have been deducted.

Businesses pay sales taxes on the purchases from BG and BS. There is a fixed state sales tax of 3% and the local sales tax can be changed by the local taxing authority. Sales tax revenue accrues to the jurisdiction of the seller rather than to the jurisdiction of the buyer. State sales taxes are paid on purchases from the outside system as well as on local purchases.

h. Income

Basic industry net income is obtained by subtracting all of the above expenditures from the gross income. By comparing the net income of a basic industry with the market value of its building and land, the owner may develop an annual rate of return figure for the industry.

27

8. Commercial Establishment Detail (Figure 27)

The computer output for commercial establishments is slightly different for business commercial (BG and BS) and for personal commercial (PG and PS). The major difference is that BG and BS always purchase their needed supplies from the outside system, whereas PG and PS are able to purchase their goods and services from local BG and BS establishments.

The commercial output shows the location, type and level of development. The interpretation of value ratio is the same as for basic industry, with the addition that the number of customers served above a certain point contributes to an increase in the depreciation. This depreciation due to use occurs when the capacity used by the commercial establishment exceeds the effective capacity.

Maintenance level, MS serving, MS use index, salary, employees, and employment effect have the same explanation for commercial establishments as for basic industry as described in the previous section.

a. Capacity Used and Effective Capacity

The effective capacity is calculated for commercial establishments in the same way units produced are calculated for basic industry -- the employment effect times

FIGURE 27

```
*******************************************************************
        TRI-CITY
  ECONOMIC  DECISION MAKER  G   BUSINESS OUTPUT
*******************************************************************

                       BUSINESS DETAIL OUTPUT
                                BG


                LOCATION                         11054
                TYPE AND LEVEL                     BG1
                VALUE RATIO                         85
                MAINTENANCE LEVEL                   85
                MS SERVING                           5
                MS USE INDEX                       139
                SALARY (PER WORKER)
                    HIGH                           100
                    MIDDLE                          50
                    LOW                             25
                EMPLOYEES
                  FULL TIME (IN PTS)
                    HIGH                            14
                    MIDDLE                           7
                    LOW                              8
                  PART TIME (IN UNITS)
                    HIGH                            80
                    MIDDLE                           0
                    LOW                              0
                EMPLOYMENT EFFECT                 5000
                CAPACITY USED                     3180
                EFFECTIVE CAPACITY                4250
                PRICE/CU                        100000
                INCOME
                    SALES(PRIVATE)            318000000
                    SALES(PUBLIC)                     0
                EXPENDITURES
                    SERVICE CHARGES            26394000
                   MAINTENANCE                   750000
                   UTILITIES                    1120000
                   TRANSPORTATION
                      TO TERMINAL               1272000
                   SALARIES
                    HIGH                       18000000
                    MIDDLE                      5600000
                    LOW                         4000000
                   PROPERTY TAXES                665000
                   SALES TAXES                   814320
                   INCOME TAXES               131242146
                NET INCOME                    128142534
```

value ratio divided by 100. The effective capacity indicates the number of capacity units (CU's) that the commercial establishment can supply to its customers without a strain on plant and equipment.

Capacity used is the number of CU's that the commercial establishment actually sold to customers in the local market as decided by the commercial process. If the capacity used exceeds the effective capacity, then the commercial establishment undergoes a strain on its plant and equipment that is represented by increased depreciation of the physical facilities. BG and BS establishments may sign contracts with local government departments (Schools and Municipal Services) to automatically supply these departments with their needed goods and services. If these two government departments do not make a contract with a local firm, they will purchase from the outside system at greater than normal prices per unit. These government departments can specify a contract with more than one local establishment by indicating the percentage of purchases from each establishment and the priority (the one they most want to purchase from) to each establishment. Greater detail on these contracts is given under the description of the government sector.

b. Price per Capacity Unit (CU)

Unlike basic industry which have their prices determined by the business cycle, each commercial establishment sets its own price. Factors that must be taken into account when setting the price are location in relation to potential workers, buyers and sellers, competitive establishments, local demand, boycotts, and the typical price. Typical prices are listed in the Economic Master Table.

The Commercial Process assigns customers to commercial establishments on the basis of least cost of the CU including the customer's transportation cost to get to the commercial establishment. Customers also are given a bias to shop where they shopped the previous year and a bias against shopping at over-crowded establishments.

Owners of commercial establishments are encouraged to examine the commercial allocation summary output to see which stores are serving which customers. A detail description of this output can be found under the General Output Section.

c. Income

Sales to private customers and sales to public customers are separated for BG and BS, but not for PG and PS since the latter establishments only sell to the private sector. Income is the product of capacity used and price per CU.

d. Expenditures

BG and BS spend money for service charges which represent purchases from the outside system. PG and PS spend money for business goods and business services that represent the finished goods and services that they require in order to operate. In both cases, the dollar amount of expenditures for goods and services (service charges) is directly related to the number of capacity units sold. These relationships are shown in the Economic Master Table.

Commercial establishments must pay annual maintenance if the value ratio is to be prevented from declining. BG and BS pay their maintenance to the outside system, whereas PG and PS purchase units of BG and BS for the purposes of maintenance. These relationships are also shown in the Economic Master Table along with the factors that cause depreciation. Remember that overcrowding of commercial establishments causes the depreciation rate to increase.

Commercial establishments purchase utilities based upon type and level of development as indicated in the Economic Master Table. The typical price per utility unit is $10,000, but this may vary in response to local Utility Department circumstances.

PG and PS have transportation charges to BG and BS if they purchase locally, BG has transportation to terminal to purchase goods from the outside system, and BS has no transportation charges. The transportation costs by type of road to the several destinations are given in the Economic Master Table.

Salary payments are calculated for each income class on the same basis as for basic industry -- the wage per worker times the number of workers per Pl times the number of Pl's employed. Likewise, taxes are calculated in the same manner as for residences and basic industry. Sales taxes are paid to the jurisdiction where the seller is located, and purchases from the outside are taxed at the same state tax rate as local purchases.

e. Net Income

The net income of commercial establishments is calculated in the same fashion as for residences and basic industry -- income minus expenditures. Net income for commercial establishments can be very volatile because of the competitive aspect of the local market and the control over pricing, so the calculation of rates of return by comparing net income with the value of the development and land becomes even more important for these activities.

H. Social Decision-Maker Output

1. Population Detail (Figure 28)

This output summarizes the social and economic status for each population unit which a social decision-maker controls. The income class of the population units are indicated at the top of the form. The following items are indicated:

a. Location - the location of the residence at which the population units live. This residence is owned by an economic decision-maker. (See Economic Status Map)

b. Number of Pl's - the number of population units of that particular class living at the location. Remember, there are 500 people in a population unit.

c. Education Level - ranges from 0-39 for Pl, 40-69 for PM, and 70-99 for PH and determines the ability of a Pl to get a good job.

d. Voter Registration - number of voters registered for each population unit of each class. Normal registered voters are 100 for PL, 140 for PM and 200 for PH.

e. Dissatisfaction Index - the total amount of dissatisfaction resulting from residential and personal dissatisfaction. Pl's with the highest dissatisfaction indices will migrate out of the city and seek better jobs, housing, etc.

f. Previous Savings - total savings (i.e., unspent funds) from preceding rounds.

g. Income - income from full-time employment, part-time employment and (for unemployed) welfare payments specified by the Chairman.

h. Expenditures - total amount of expenditures for rent, transportation (by auto, bus or rail),purchases of goods and services, private schools and taxes.

i. Savings - amount of income not spent this round.

j. New Balance - current savings plus previous savings.

FIGURE 28

```
     *****************************************************************************
                                   TRI-CITY
                           SOCIAL DECISION MAKER DD
     *****************************************************************************

MIDDLE SOCIO-ECONOMIC CLASS


LOCATION                              11252      10854      10856      11258
NUMBER OF PI'S                           55         23         41          8
EDUCATION LEVEL                          43         61         58         45
VOTER REGISTRATION                      151        151        151        151
DISSATISFACTION INDEX                     0          0          0          0
PREVIOUS SAVINGS                          0          0          0          0


INCOME
    EMPLOYMENT(FULL)               22000000   18400000   32800000    3200000
    EMPLOYMENT(PART)                      0    2380000    3891000          0
    WELFARE                               0          0          0          0

EXPENDITURES
    RENT                            9386666    4630666    8036000    1482666
    TRANSPORTATION
       AUTO                          142560     212576    2522756     108032
       BUS                                0          0          0          0
       RAIL                               0          0          0          0
    GOODS                          15812500    6612500   11787500    2300000
    SERVICES                        6462500    2702500    4817500     940000
    SCHOOL (CHILDREN)                386000          0          0          0
    SCHOOL (ADULTS)                       0          0          0          0
    SALES TAX                       1225124     512324     913274     178200
    INCOME TAX                      1650000    1547700    2720415     240000
    AUTOMOBILE TAXES                      0        130      18091          0
SAVINGS                           -13062500    4560900    5875300   -2048000
NEW BALANCE                       -13062500    4560900    5875300   -2048000

TIME ALLOCATION

     TRANSPORTATION                       1          1          1          1
     EXTRA JOB (10)                       0         10         10          0
     EDUCATION
        PUBLIC (30)                       6          6          6          7
        PRIVATE ( 0)                      0          0          0          0
     POLITICS (30)                       30         30         30         30
     RECREATION (15)                     15         15         15         15
     INVOLUNTARY                         48         38         38         47

DOLLAR VALUE OF TIME UNIT TRAVELING -        60
```

k. Time Allocation (Requested) - in parentheses is the amount of time units requested to be allocated to various activities, either jurisdiction-wide or for a particular parcel. In the columns is the amount of time actually spent in these activities as listed, with the amount of time spent traveling to and from work. Time spent traveling to and from work cuts into time available for allocation.

l. Involuntary Time - the total number of time units which were allocated for a particular activity but were unable to be spent in that activity. Involuntary time affects dissatisfaction.

m. Dollar Value of Time Unit Traveling - the dollar value (set by social decision-maker) of a population unit's time spent going to and from work. Normal values are $25 for PL, $50 for PM, and $100 for PH. Dollar value of time is the criteria which the computer considers when assigning a mode of transportation (bus, rail, or auto) to work.

2. Boycott Status (Figure 29)

This output shows the social decision-maker which population units he controls are boycotting various work or shop locations and/or the bus or rail modes of transportation. All boycotts remain in effect until a decision is made to stop them.

FIGURE 29

```
**********************************************************************
          C I T Y   M O D E L      S A M P L E   O U T P U T
        SOCIAL DECISION MAKER E   BOYCOTT STATUS OUTPUT
**********************************************************************


               BOYCOTTING                            BOYCOTTED
               ----------                            ---------
        CLASS OR
 TEAM   LAND USE   FUNCTION       LOCATION   LAND USE   OWNER
 ----   --------   --------       --------   --------   -----

  E      HIGH        SHOP           9230        PG        E
```

I. Government Output

1. Government Financial Summary (Chairman and Council) (Figure 30)

This output summarizes the current and capital expenditures of each municipal department in the city in addition to providing a statement of the Chairman and Council's total revenues (from taxes and bonds) and expenditures (for appropriations to the department, subsidies and bond payments).

2. Tax Summary (Chairman and Council) (Figure 31)

The tax summary indicates the revenue from various taxes in each jurisdiction. It is given to the Chairman and provides a basis for computing tax rates in future rounds.

3. Assessment Constants (Figure 32)

This output lists the new development value of all land uses in addition to indicating the minimum land/development ratio for each land use.

4. Assessment Factors (Figure 33)

The first portion of this output shows, for each jurisdiction, the assessment rate for all land -- either developed or undeveloped (UL) -- and the assessment rate for all developments. Assessment rates are applied to the market value of land and developments.

The second section prints only if there were assessment decisions during the previous round. This portion lists the assessment factors for each zone and the location and value of any special assessments. Any assessment input errors are also listed here.

5. Land Assessment Map (Figure 34)

The value printed on this map is the assessed value of the privately owned portion of the parcel. The owner's tax payment is this value multiplied by the land tax rate.

6. Development Assessment Map (Figure 35)

The value indicated here is the original value (typical value) of the development times the development assessment ratio times the development's value ratio. The owner's tax payment is this value multiplied by the development tax rate.

FIGURE 30

```
**.*****************************************************************************************************************************
             C I T Y   M O D E L      S A M P L E   O U T P U T
                  BUDGET-CHAIRMAN AND COUNCIL OUTPUT                                             JURISDICTION 1     ROUND  3
**.*****************************************************************************************************************************

THE POPULATION IS   144000



WELFARE PAYMENT PER UNEMPLOYED WORKER IS 1500.


                              MUNICIPAL SERVICES
                              ------------------

         CAPITAL                                         CURRENT
         -------                                         -------

  PREVIOUS CASH BALANCE            74981000.    PREVIOUS CASH BALANCE        1202000.

  REVENUES                                      REVENUES
       APPROPRIATIONS              40000000.      APPROPRIATIONS            10000000.
       BONDING                           0.       FED/STATE AID                   0.
       MISC. INCOME                      0.       BONDING                    2110000.
                                                  MISC. INCOME                    0.

                                   --------                                 --------
  TOTAL                            40000000.    TOTAL                       12110000.


  EXPENDITURES                                  EXPENDITURES
       CONSTRUCTION                26300000.      BOND PAYMENTS               470000.
       LAND PURCHASE                     0.       GOODS + SERVICES           4800000.
       MISCELLANEOUS                     0.       MISCELLANEOUS                   0.
                                                  SALARIES                   8040000.
                                                  WELFARE PAYMENTS                0.


                                   --------                                 --------
  TOTAL                            26300000.    TOTAL                       13310000.

  NEW CASH BALANCE                 88681000.    NEW CASH BALANCE                2000.

------.-----------------------------------------------------------------------------
------.-----------------------------------------------------------------------------


                                  SCHOOLS
                                  -------

         CAPITAL                                         CURRENT
         -------                                         -------

  PREVIOUS CASH BALANCE            15244000.    PREVIOUS CASH BALANCE           1850.

  REVENUES                                      REVENUES
       APPROPRIATIONS              50000000.      APPROPRIATIONS            24000000.
       BONDING                           0.       FED/STATE AID              7092000.
       MISC. INCOME                      0.       BONDING                    8300000.
       FED/STATE AID                     0.       MISC. INCOME                    0.

                                   --------                                 --------
  TOTAL                            50000000.    TOTAL                       39392000.


  EXPENDITURES                                  EXPENDITURES
       CONSTRUCTION                      0.       BOND PAYMENTS              4760000.
       LAND PURCHASE                     0.       GOODS + SERVICES           4980000.
       MISCELLANEOUS                     0.       MISCELLANEOUS                   0.
                                                  SALARIES                  19000000.
                                                  ADULT EDUCATION           10650000.


                                   --------                                 --------
  TOTAL                                  0.     TOTAL                       39390000.

  NEW CASH BALANCE                 65244000.    NEW CASH BALANCE                3850.

------.-----------------------------------------------------------------------------
------.-----------------------------------------------------------------------------
```

FIGURE 30 (Cont'd)

```
                                    HIGHWAYS
                                    --------

          CAPITAL                                          CURRENT
          -------                                          -------

PREVIOUS CASH BALANCE       22500000.   PREVIOUS CASH BALANCE          1334.

REVENUES                                REVENUES
    APPROPRIATIONS          25000000.     APPROPRIATIONS             500000.
    BONDING                       0.      BONDING                   1500000.
    MISC. INCOME                  0.      MISC. INCOME                    0.
    FED/STATE AID                 0.

                            --------                                -------
TOTAL                       25000000.   TOTAL                       2000000.

EXPENDITURES                            EXPENDITURES
    [illegible]                   0.      MAINTENANCE                281599.
    [illegible]                   0.      BOND PAYMENTS             1770000.
    LAND PURCHASE                 0.
    MISCELLANEOUS                 0.      MISCELLANEOUS                   0.

                            -------                                 -------
TOTAL                             0.    TOTAL                       2051599.

NEW CASH BALANCE            47500000.   NEW CASH BALANCE               9735.

------------------------------------------------------------------------------
------------------------------------------------------------------------------

                                PLANNING AND ZONING
                                -------------------

                                      CAPITAL
                                      -------

                         PREVIOUS CASH BALANCE         17081000.
                         REVENUES
                           APPROPRIATIONS              15000000.
                           BONDING                            0.
                           MISC. INCOME                       0.
                           FED/STATE AID                      0.

                                                       -------
                         TOTAL                         15000000.

                         EXPENDITURES
                           LAND PURCHASE                      0.
                           BOND PAYMENTS                      0.
                           MISCELLANEOUS                      0.

                                                        ------
                         TOTAL                                0.

                         NEW CASH BALANCE              32081000.

------------------------------------------------------------------------------
------------------------------------------------------------------------------

                                     UTILITIES
                                     ---------

          CAPITAL                                       CURRENT
          -------                                       -------

PREVIOUS CASH BALANCE        49002700.   PREVIOUS CASH BALANCE        2607856.

REVENUES                                 REVENUES
    SUBSIDIES                      0.      INCOME FROM USERS         11500000.
    BONDING                        0.      SUBSIDIES                        0.
    MISC. INCOME                   0.      BONDING                          0.
                                           MISC. INCOME                     0.

                             -------                                  -------
TOTAL                              0.    TOTAL                       11500000.

EXPENDITURES                             EXPENDITURES
    PLANT CONSTRUCTION             0.      OPERATING COSTS            9222222.
    EXTENSION OF SERVICE           0.      TAXES                            0.
    LAND PURCHASE                  0.      BOND PAYMENTS               970000.
    MISCELLANEOUS                  0.      MISCELLANEOUS                    0.
    LINE CONSTRUCTION              0.

                             -------                                  -------
TOTAL                              0.    TOTAL                       10192222.

NEW CASH BALANCE             49002700.   NEW CASH BALANCE             3915634.

------------------------------------------------------------------------------
------------------------------------------------------------------------------
```

FIGURE 30 (Cont'd)

```
                 CHAIRMAN'S ACCOUNTING
                 ---------------------

                        CURRENT
                        -------

     PREVIOUS CASH BALANCE                1120.
     REVENUES
       TAXES                          16979498.
       NEW BONDING                   254570000.
       MISCELLANEOUS                         0.


                                       -------
     TOTAL                           273549498.


     EXPENDITURES
       APPROPRIATIONS                164500000.
       SUBSIDIES                             0.
       BOND PAYMENTS                 109050000.
       MISCELLANEOUS                         0.


                                       -------
     TOTAL                           273550000.


     NEW CASH BALANCE                      618.

--------------------------------------------------------------------------
--------------------------------------------------------------------------


                    OUTSTANDING BONDS
                    -----------------


  TYPE          ORIGINAL     REMAINING     INTEREST         ANNUAL
                PRINCIPAL      TERM          RATE           PAYMENT
  ----          ---------    ---------     --------         -------

  CURRENT        7740000.       0            3.2           4050000.
  CURRENT      198910000.       1            3.7         105000000.
  CURRENT      254570000.       2            3.2         133420000.
```

```
*****************************************************************************************************
          C I T Y   M O D E L     S A M P L E   O U T P U T
              F I N A N C I A L   S U M M A R Y                           JURISDICTION 1     ROUND  3
*****************************************************************************************************

     DEPARTMENT                      MUNICIPAL        SCHOOLS        HIGHWAYS        PLANNING         UTILITY        CHAIRMAN
                                      SERVICE                                      AND ZONING

PREVIOUS CASH BALANCE                76183000.       19245850.       22901334.       17081000.       51610556.           1120.

CAPITAL REVENUES                     40000000.       50000000.       25000000.       15000000.              0.              0.

CURRENT REVENUES                     12110000.       39392000.        2060000.              0.       11500000.      273549498.

CAPITAL EXPENDITURES                 26300000.              0.              0.              0.              0.              0.

CURRENT EXPENDITURES                 13310000.       39390000.        2051599.              0.       10192222.      273550000.

NEW CASH BALANCE                     88683000.       69247850.       47909735.       32081000.       52918334.            618.
```

FIGURE 31

```
**.***.*******.************.**.*.*********.*********************.**************.***************.*************
            C I T Y   M O D E L      S A M P L E   O U T P U T
                                      T A X   S U M M A R Y                   JURISDICTION 1     ROUND  3
**.***.*******.************.**.*.*********.*********************.**************.***************.*************

ITEM                               BASE           RATE          REVENUE

PROPERTY TAX LAND          $      63240000.   4.0 PERCENT   $      2529600
             IMPROVEMENT   $     125090000.   4.0 PERCENT   $      5003600
RESIDENT INCOME TAX        $     306796990.   3.0 PERCENT   $      9203910
EMPLOYEE INCOME TAX                            .0 PERCENT   $            0
RESIDENT AUTOMOBILE TAX    $       8207400.   1.0 PERCENT   $        82074
EMPLOYEE AUTOMOBILE TAX                        .0 PERCENT   $            0
GOODS SALES TAX            $     102231732.   1.5 PERCENT   $      1533476
SERVICES SALES TAX         $      41789199.   1.5 PERCENT   $       626838

TOTAL REVENUE                                               $     18979498.
```

FIGURE 32

```
    ****************************************************************
           TRI-CITY
                                          ASSESSMENT CONSTANTS
    ****************************************************************

LAND USE    NEW DEVELOPMENT VALUE

   LI                 60000000.
   HI               1050000000.
   NS                 50000000.
   CI               1200000000.
   BG                250000000.
   BS                100000000.
   PG                380000000.
   PS                100000000.
   RA                 10000000.
   RB                 60000000.
   RC                250000000.

LAND USE    MINIMUM LAND/DEVELOPMENT VALUE RATIO

   LI                 30.0 %
   HI                 30.0 %
   NS                 30.0 %
   CI                 30.0 %
   BG                 25.0 %
   BS                 25.0 %
   PG                 25.0 %
   PS                 25.0 %
   RA                 20.0 %
   RB                 10.0 %
   RC                  5.0 %
```

FIGURE 33

```
ASSESSMENT FACTORS                                   JURISDICTION 2          ROUND 3

 LAND USE        LAND RATE        DEVELOPMENT RATE

    LI             52.5 %             32.3 %
    HI             52.5 %             90.0 %
    NS             52.5 %             85.0 %
    CI             20.0 %             30.0 %
    BG             45.0 %             40.1 %
    BS             52.5 %             40.1 %
    PG             52.5 %             40.1 %
    PS             52.5 %             40.1 %
    RA             52.5 %             40.1 %
    RB             52.5 %             40.1 %
    RC             52.5 %             40.1 %


                  ASSESSMENT FACTORS FOR ZONE I, WHICH IS FROM 97-21 to 99-26

 LAND USE        LAND RATE        DEVELOPMENT RATE

    LI             52.5 %             89.6 %
    HI             52.5 %             89.6 %
    NS             52.5 %             89.6 %
    CI             20.0 %             89.6 %
    BG             45.0 %             89.6 %
    BS             52.5 %             89.6 %
    PG             52.5 %             89.6 %
    PS             52.5 %             89.6 %
    RA             52.5 %             89.6 %
    RB             52.5 %             89.6 %
    RC             52.5 %             89.6 %
    UL             52.5 %
SPECIAL ASSESSMENT (X $100,000'S)

LOCATION        LAND        BUILDING
 100-30           1            0
 102-28           0            0
```

FIGURE 34

```
**.***.*****.*.*****.*****.***.*********.***********.*.*********.****************.****
                                          C I T Y   M O D E L       S A M P L E   O U T P U T
                                  LAND ASSESSMENT AMOUNT MAP             (IN $100,000'S)
**.**********.*****************.*****************.*********.**********************.***
         70    72    74    76    78    80    82    84    86    88    90    92    94    96    98   100   1
     ...........................................................................................
 12 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    .
 14 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    .
 16 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    .
 18 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    .
 20 .     0     0     0     0     0     0     0     0     0     0     0     0    25    25     0     0
    .
 22 .     0     0     0     0     0     0     0     0    15    15    15    15     1     1     3     5
    .
 24 .     0     0     0     0     0     0     0     0    15    15    15     0     1     5    18     4
    .
 26 .     0     0     0     0     0     0     0     0     0     5     4     2     1   271    43     9
    .
 28 .     0     0     0     0     0     0     0     0     4     6     1    14    90   107    94     5
    .
 30 .     0     0    41     0     0     0    34     8     7     9    16    43     0   105    42     2
    .
 32 .     0     0     0     0     0     0    34     8     7     2    19    16    62    82    16    17
    .
 34 .     0     0     0     0     0     0     0     0     6     2     2    22    11     0    19     0
    .
 36 .     0     0     0     0     0     0     0     0     0     7     3     2     5    14    16     0
    .
 38 .     0     0     0     0     0     0     0     0     0    83     2     1     2     3     3     0
    .
 40 .     0     0     0     0     0     0     0     0     0     0     0     0    25    25     0     0
    .
 42 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    .
 44 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    .
 46 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    .
 48 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    .
 50 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    .
 52 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    .
 54 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    .
 56 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    .
 58 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    .
 60 .     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    ...........................................................................................
```

FIGURE 35

```
**.*************************************************************************
                            C I T Y   M O D E L       S A M P L E   O U T P U T
                  DEVELOPMENT ASSESSMENT AMOUNT MAP         (IN $100,000'S)
**.*************************************************************************
       70   72   74   76   78   80   82   84   86   88   90   92   94   96   98  100  102
... ........................................................................
12 .    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
   .
14 .    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
   .
16 .    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
   .
18 .    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
   .
20 .    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
   .
22 .    0    0    0    0    0    0    0    0    0    0    0    0    0    1    5   11    0
   .
24 .    0    0    0    0    0    0    0    0    0    2    0    0    2   18   27   10   12
   .
26 .    0    0    0    0    0    0    0    0    0   12   11    9    3 1020  225   12    9
   .
28 .    0    0    0    0    0    0    0    0   13   17    3   45  270  472  570    5    4
   .
30 .    0    0    0    0    0    0    0   27   27   94  200  135    0  446  135    7    5
   .
32 .    0    0    0    0    0    0    0   27   27    8   72  100  255  420   40   17    7
   .
34 .    0    0    0    0    0    0    0    0   15   12   22   66   89    0   89    0    0
   .
36 .    0    0    0    0    0    0    0    0    0   20    8   24   48   48   48    0    0
   .
38 .    0    0    0    0    0    0    0    0    0    0    4    4   12   16   12    0    0
   .
40 .    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
   .
42 .    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
   .
44 .    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
   .
46 .    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
   .
48 .    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
   .
50 .    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
   .
52 .    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
   .
54 .    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
   .
56 .    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
   .
58 .    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
   .
60 .    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
... ........................................................................
```

FIGURE 36

```
**.*******************************************************************************
                                        C I T Y  M O D E L     S A M P L E   O U T P U T
                          TOTAL ASSESSMENT AMOUNT        (IN $100,000'S)
**.*******************************************************************************
        70   72   74   76   78   80   82   84   86   88   90   92   94   96   98  100  102
... ..............................................................................
 12 .    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    .
 14 .    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    .
 16 .    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    .
 18 .    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    .
 20 .    0    0    0    0    0    0    0    0    0    0    0    0   25   25    0    0    0
    .
 22 .    0    0    0    0    0    0    0    0   15   15   15   15    1    2    8   16    0
    .
 24 .    0    0    0    0    0    0    0    0   15   17   15    0    3   23   45   14   18
    .
 26 .    0    0    0    0    0    0    0    0    0   17   15   11    4 1291  268   21   14
    .
 28 .    0    0    0    0    0    0    0    0   17   23    4   59  360  579  664   10    7
    .
 30 .    0    0   41    0    0    0   34   35   34  103  216  178    0  551  177    9    8
    .
 32 .    0    0    0    0    0    0   34   35   34   10   91  118  317  502   56   34   11
    .
 34 .    0    0    0    0    0    0    0    0   21   14   24   88  100    0  108    0    0
    .
 36 .    0    0    0    0    0    0    0    0    0   27   11   26   53   62   64    0    0
    .
 38 .    0    0    0    0    0    0    0    0    0   83    6    5   14   19   15    0    0
    .
 40 .    0    0    0    0    0    0    0    0    0    0    0    0   25   25    0    0    0
    .
 42 .    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    .
 44 .    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    .
 46 .    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    .
 48 .    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    .
 50 .    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    .
 52 .    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    .
 54 .    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    .
 56 .    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    .
 58 .    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
    .
 60 .    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
... ..............................................................................
```

7. Total Assessment Map (Figure 36)

These maps indicate (in $100,000's) the assessed value (assessment rate *times* market value) of land and developments and the total assessed value (land *plus* developments) of all parcels in the simulated area. Only the privately owned portion of the land is assessed.

8. School Department Detail (Figure 37)

This output shows the status of the School Department for each jurisdiction. It gives the following information:

a. School Units - the numerical designation, development level, location, maintenance level, and value ratio of each school; the number of students (by class) at each school; the number of teachers at each school (by class); the student/teacher ratio at each school; and the use index of each school. (Remember, as the use index increases above 100, the school is being overused.)

b. Undeveloped land - indicates the amount and location of all undeveloped land which the School Department owns.

c. Contracts - the location and owner of BG and BS establishments with which the School Department has contracts. This section also indicates the price paid per capacity unit of BG and BS, the amount of capacity units, and the amount of goods and services bought from the outside system.

d. Bonds - the number, type, remaining term and annual payment on bonds which the department has outstanding.

e. Adult Education - the amount of part-time employment requested and obtained, the actual and used capacity, and unmet demand for adult education.

f. Financial Accounting - the current and capital revenues and expenditures of the department in addition to the amount of federal-state aid available for construction.

FIGURE 37

```
**.*********************************************************************************************************
        C I T Y  M O D E L      S A M P L E   O U T P U T                   JURISDICTION 1     ROUND  3
             S C H O O L   D E P A R T M E N T
**.*********************************************************************************************************


S C H O O L   U N I T S
-----------------------

                                                          S T U D E N T S
                           MAINTENANCE      VALUE     -----------------------       TEACHERS REQUESTED   STUDENT/TEACHER
SCHOOL  LOCATION LEVEL        LEVEL         RATIO      HIGH     MIDDLE      LOW       HIGH    MIDDLE          RATIO            USE INDEX
-----------------------------------------------------------------------------------------------------------------------------------------

                                                          0      13860     1000         3        2              22                97
  1      9030      1          90             90       10270       5600        0         5        4              13                62
  2      9032      1          90             90         650        140        0         3        2               1                 4
  6      6630      1          90             98


U N D E V E L O P E D   L A N D
-------------------------------

            LOCATION     AMOUNT
            --------     ------

              9034         24


C O N T R A C T S
-----------------
                             PERCENTAGE   OF    COST PER        CAPACITY       TOTAL
TYPE   OWNER   LOCATION     TOTAL PURCHASES        UNIT        UNITS USED      COST
--------------------------------------------------------------------------------------------------------------------------

                                   55          100000             16        1600000
 60      C     98- 30              45          130000             12        1560000
 60   OUTSIDE                      30          110000              4         440000
 35      6     98- 32              70          130000              6         780000
 65   OUTSIDE
                                                                            4380000




**.****************************************************************************************************************
                              C I T Y  M O D E L      S A M P L E    O U T P U T    JURISDICTION   1      ROUND  3
                              SCHOOL DEPARTMENT CONSTRUCTION TABLE                  ***********************************
**.*****************************************************************************   FEDERAL/STATE AID   MAINTENANCE     EMPLOYMENT
                                              OLD            NEW           AGREED        AMOUNT USED          LEVEL        MIC.  HIGH
CONSTRUCTION       SITE                      LEVEL          LEVEL          PRICE      ***************   ***********    *****  *****
    FIRM          LOCATION        STATUS     *****          *****       **********
*************     ********       ******.
                                                                                                 0               90           2      3
                                                              1           35100000
      0             6636        COMPLETED      0
```

FIGURE 37 (Cont'd)

```
*****************************************************************************************************
              C I T Y   M O D E L     S A M P L E   O U T P U T
                S C H O O L   F I N A N C E S                              JURISDICTION 1    ROUND  3
*****************************************************************************************************



              CAPITAL                                          CURRENT

REVENUES                                             REVENUES


PREVIOUS CASH BALANCE          19244000              PREVIOUS CASH BALANCE             1850
APPROPRIATIONS                 50000000              APPROPRIATIONS                24000000
FEDERAL-STATE AID USED                0              FEDERAL-STATE AID USED         7092000
NEW BONDS                             0              NEW BONDS                      8300000
MISCELLANEOUS                         0             MISCELLANEOUS                         0
                             ----------                                          ----------
        TOTAL                  69244000                                            39393850


EXPENDITURES                                         EXPENDITURES

SCHOOL CONSTRUCTION                   0              GOODS AND SERVICES             4380000
LAND PURCHASES                        0              FULL-TIME SALARIES            19600000
MISCELLANEOUS                         0              MISCELLANEOUS                        0
                                                     BOND PAYMENTS                  4760000
                                                     ADULT EDUCATION               10650000
                             ----------                                          ----------
        TOTAL                         0                                            39390000


CURRENT BALANCE                69244000              CURRENT BALANCE                   3850



                          OUTSTANDING BONDS
                          -----------------


     TYPE           ORIGINAL      REMAINING     INTEREST        ANNUAL
                    PRINCIPAL       TERM          RATE          PAYMENT
     ----           ---------     ---------     --------        -------

    CAPITAL         12000000.       12             4.7          820000.
    CURRENT          5820000.        0             3.2         3050000.
    CAPITAL          4390000.       24             3.2          250000.
    CURRENT          1230000.        1             3.6          640000.
    CURRENT          8300000.        2             3.2         4350000.




. F E D E R A L / S T A T E   A I D   A V A I L A B L E   F O R   S C H O O L   C O N S T R U C T I O N
----------------------------------------------------------------------------------------------------

        LEVEL          LOCATION
          1              6830
```

9. School Map (Figure 38)

This map shows the location of all schools in the city (indicated by "SC") and the districts which each school serves (marked by XXX). For each parcel with a residence on it, it also shows the number of students (in 100's) attending the school (upper number) and the number of students (in 100's) going to schools outside the system (lower number).

10. Municipal Services Map (Figure 39)

This map shows the location of all municipal service plants (the parcels surrounded by asterisks). The parcels that receive service from these municipal services are identified with the number of the MS unit. For example, a parcel with "1" on it is serviced by the number 1 MS unit (the parcel surrounded by asterisks with the number "1" inside).

11. Municipal Services Detail (Figure 40)

This output summarizes the status of the Municipal Services Department and shows the following items:

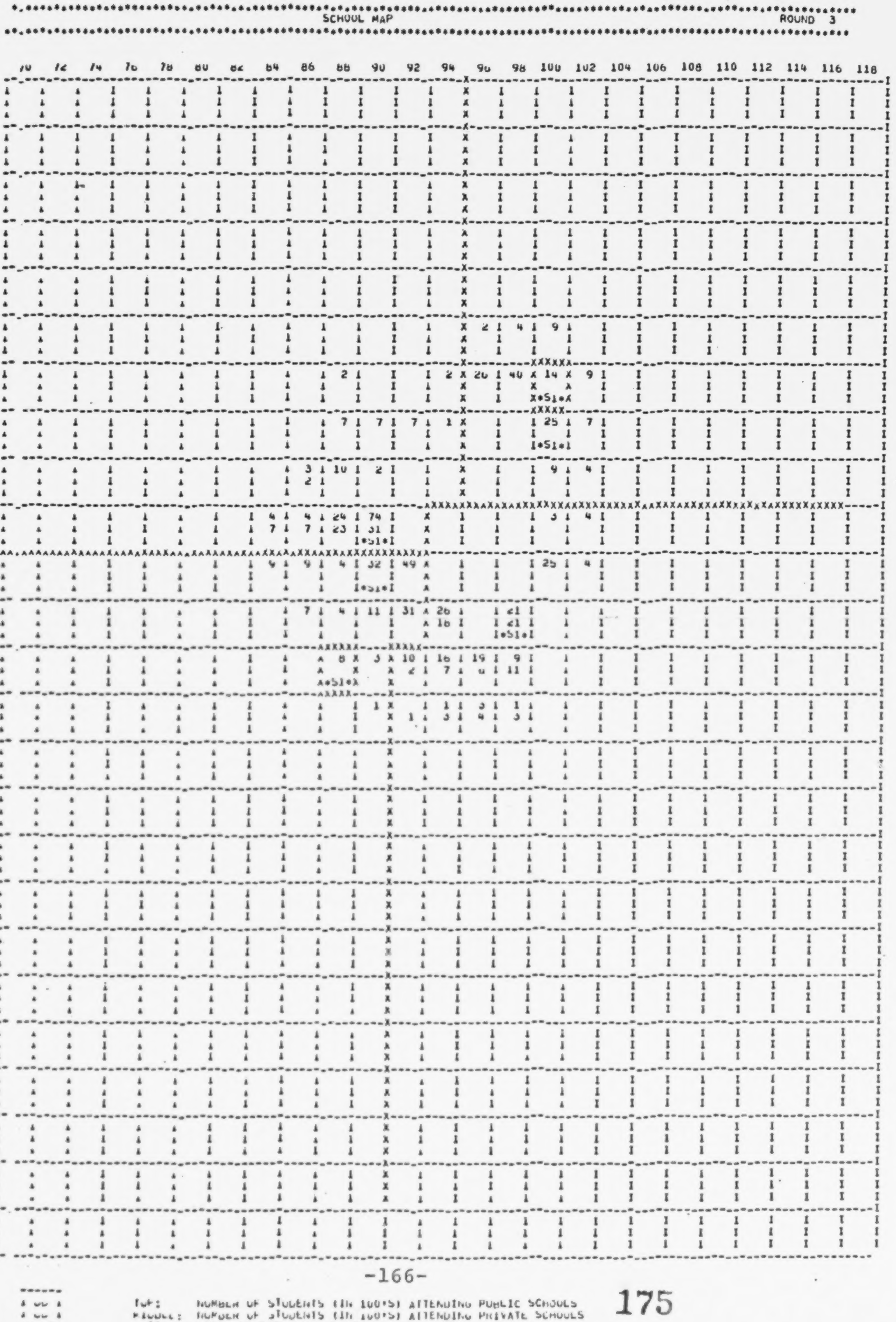
a. MS Characteristics - the numerical designation location, development level, maintenance level and value ratio of each MS plant. In addition, this section of output indicates the effective capacity of service, the loading (actual service drained), the employment, and the MS use index of each plant (use index will always be greater than 100 when loading is greater than effective capacity), the salary paid each MS worker, and the welfare payments to each unemployed worker in the jurisdiction.

b. Contracts - the owner, location and cost of BG and BS purchases from within the local system as well as contracts (if any) for goods and services from the outside system.

c. Outstanding Bonds - the number of outstanding bonds, their remaining term, the interest rate, annual payment and principal.

d. Financial Accounting - the current and capital expenditures and revenues of the department.

FIGURE 38



TOP: NUMBER OF STUDENTS (IN 100'S) ATTENDING PUBLIC SCHOOLS
MIDDLE: NUMBER OF STUDENTS (IN 100'S) ATTENDING PRIVATE SCHOOLS
BOTTOM: LEVEL OF SCHOOL ON PARCEL
AAAAAA: SCHOOL DISTRICT BOUNDARY

FIGURE 39

```
MUNICIPAL SERVICES MAP

        70    72    74    76    78    80    82    84    86    88    90    92    94    96    98   100   102   104
 ..................................................................................................................
 .================================================================================================================
12.I     1     1     1     1     1     1     1     1     1     1     1     1     1 I   3     3     3     3     3
  .I                                                                               I
14.I     1     1     1     1     1     1     1     1     1     1     1     1     1 I   3     3     3     3     3
  .I                                                                               I
16.I     1     1     1     1     1     1     1     1     1     1     1     1     1 I   3     3     3     3     3
  .I                                                                               I
18.I     1     1     1     1     1     1     1     1     1     1     1     1     1 I   3     3     3     3     3
  .I                                                                               I
20.I     1     1     1     1     1     1     1     1     1     1     1     1     1 I   3     3     3     3     3
  .I                                                                               I           *****
22.I     1     1     1     1     1     1     1     1     1     1     1     1     1 I   3     3 ** 4*     3     3
  .I                                                                               I           *****
24.I     1     1     1     1     1     1     1     1     1     1     1     1     1 I   3     3     3     3     3
  .I                                                                               I     *****
26.I     1     1     1     1     1     1     1     1     1     1     1     1     1 I   3 ** 3*     3     3     3
  .I                                                                               I     *****
28.I     1     1     1     1     1     1     1     1     1     1     1     1     1 I   3     3     3     3     3
  .I                                                                          =====I
30.I     1     1     1     1     1     1     1     1     1     1     1     1 I* 2*     2     2     2     2     2
  .I                                                                    *****I****
32.I     1     1     1     1     1     1     1     1     1     1     1  ** 1*I   2     2     2     2     2     2
  .I                                                                    *****I
34.I     1     1     1     1     1     1     1     1     1     1     1     1 I   2     2     2     2     2     2
  .I                                                                    =====I
36.I     1     1     1     1     1     1     1     1     1     1     1 I   2     2     2     2     2     2     2
  .I                                                                   I
38.I     1     1     1     1     1     1     1     1     1     1     1 I   2     2     2     2     2     2     2
  .I                                                                   I
40.I     1     1     1     1     1     1     1     1     1     1     1 I   2     2     2     2     2     2     2
  .I                                                                   I
42.I     1     1     1     1     1     1     1     1     1     1     1 I   2     2     2     2     2     2     2
  .I                                                                   I
44.I     1     1     1     1     1     1     1     1     1     1     1 I   2     2     2     2     2     2     2
  .I                                                                   I
46.I     1     1     1     1     1     1     1     1     1     1     1 I   2     2     2     2     2     2     2
  .I                                                                   I
48.I     1     1     1     1     1     1     1     1     1     1     1 I   2     2     2     2     2     2     2
  .I                                                                   I
50.I     1     1     1     1     1     1     1     1     1     1     1 I   2     2     2     2     2     2     2
  .I                                                                   I
52.I     1     1     1     1     1     1     1     1     1     1     1 I   2     2     2     2     2     2     2
  .I                                                                   I
54.I     1     1     1     1     1     1     1     1     1     1     1 I   2     2     2     2     2     2     2
  .I                                                                   I
56.I     1     1     1     1     1     1     1     1     1     1     1 I   2     2     2     2     2     2     2
  .I                                                                   I
58.I     1     1     1     1     1     1     1     1     1     1     1 I   2     2     2     2     2     2     2
  .I                                                                   I
60.I     1     1     1     1     1     1     1     1     1     1     1 I   2     2     2     2     2     2     2
 .================================================================================================================

 ..................................................................................................................
        70    72    74    76    78    80    82    84    86    88    90    92    94    96    98   100   102   104


                                     M U N I C I P A L   S E R V I C E S   M A P   K E Y
                                     -----------------------------------------------------

ASTERISKS ENCIRCLE MS UNITS
NUMBER ON A PARCEL CORRESPONDS TO CODE NUMBER OF MS UNIT SERVING PARCEL
```

FIGURE 40

```
**.***********************************************************************************************************
              C I T Y  M O D E L     S A M P L E   O U T P U T
                   MUNICIPAL SERVICES DEPARTMENT                                   JURISDICTION 1    ROUND  3
**.***********************************************************************************************************

                           MAINTENANCE     VALUE    EFFECTIVE CAPACITY                   EMPLOYMENT     M.S. USE
MS  LOCATION    LEVEL         LEVEL        RATIO       OF SERVICE          LOADING     LOW    MIDDLE          INDEX
--------------------------------------------------------------------------------------------------------------

 1    92-32        2            90           90           1980              2130         6       6          108

TOTALS                                                    1980              2130         6       6          108
SALARY OFFERED LOW  2700.  MIDDLE   5000.

WELFARE PAYMENT PER UNEMPLOYED WORKER IS 1500.


C O N T R A C T S
-----------------
                            PERCENTAGE   OF   COST PER        CAPACITY        TOTAL
 TYPE   OWNER   LOCATION    TOTAL PURCHASES      UNIT        UNITS USED       COST
------------------------------------------------------------------------------------------------------------------

  06      C     98- 30            44           100000            13          1300000
  06   OUTSIDE                    56           130000            15          1950000
  05      6     98- 32            48           110000             7           770000
  05   OUTSIDE                    52           130000             6           780000

                                                                             4800000


UNDEVELOPED LAND (IN PER CENT)
------------------------------

LOCATION AMOUNT    LOCATION AMOUNT    LOCATION AMOUNT    LOCATION AMOUNT    LOCATION AMOUNT    LOCATION AMOUNT
-------- ------    -------- ------    -------- ------    -------- ------    -------- ------    -------- ------

  99-24     4


                            OUTSTANDING BONDS
                            -----------------


      TYPE             ORIGINAL     REMAINING     INTEREST          ANNUAL
                       PRINCIPAL       TERM         RATE            PAYMENT
      ----             ---------    ---------     --------          -------

     CAPITAL            7000000.        9            4.5             470000.
     CURRENT            2100000.        2            3.2            1100000.
```

```
**.***********************************************************************************************************
                                  C I T Y  M O D E L      S A M P L E   O U T P U T
                          MUNICIPAL SERVICES DEPARTMENT CONSTRUCTION TABLE             JURISDICTION  1     ROUND  3
**.***********************************************************************************************************
CONSTRUCTION      SITE                   OLD          NEW             AGREED           MAINTENANCE     EMPLOYMENT
    PLAN        LOCATION     STATUS     LEVEL        LEVEL             PRICE              LEVEL        LOW   MID.
************    ********     ******     *****        *****          **********         ***********    *****  *****


     9420         9424       PENDING      0            1             26500000              96           2      4
```

FIGURE 40 (Continued)

```
**.*************************************************************************************************************
          C I T Y   M O D E L     S A M P L E   O U T P U T
                      MUNICIPAL SERVICES FINANCES                                      JURISDICTION 1     ROUND  3
**.*************************************************************************************************************


                        FINANCIAL ACCOUNTING

     CAPITAL                                        CURRENT
PREVIOUS CASH BALANCE       74981000.     PREVIOUS CASH BALANCE       1202000.

REVENUES                                  REVENUES
    APPROPRIATIONS          40000000.       APPROPRIATIONS           10000000.
    BONDING                        0.       BONDING                   2110000.
    MISC. INCOME                   0.       MISC. INCOME                    0.
                                            FED/STATE AID                   0.


                             -------                                  -------
TOTAL                       40000000.     TOTAL                      12110000.

EXPENDITURES                              EXPENDITURES
    CONSTRUCTION            26300000.       WELFARE PAYMENTS                0.
    LAND PURCHASE                  0.       GOODS + SERVICES          4800000.
    MISCELLANEOUS                  0.       MISCELLANEOUS                   0.
                                            SALARIES                  8040000.
                                            BOND PAYMENTS              470000.


                             -------                                  -------
TOTAL                       26300000.     TOTAL                      13310000.

NEW CASH BALANCE            88681000.     NEW CASH BALANCE               2000.
```

12. Highway Department Detail (Figure 41)

This output, which is distributed to the government decision-maker representing the Highway Department, gives the basic information necessary for the operation of the department.

a. Outstanding Bonds - the bonds which the department has outstanding. This information includes the type of bonds, the number of rounds left to pay off a bond, the original amount of the bond, and the annual payment on the bond.

b. Financial Report - summary of the capital and current expenditures and revenues for the round in addition to federal-state aid available.

c. Maintenance - the road type, its maintenance level, the total number of miles of that type in the jurisdiction, the average depreciation rate of that road type before maintenance, and the number of goods and services capacity units required to maintain that road.

d. Road Conditions - indicates value ratio of all roads with value ratios of less than 90.

e. Terminals - the location of each terminal, its level, its capacity, and the number of capacity units which are being used.

f. Undeveloped Land - indicates the amount and location of the undeveloped land which the Highway Department owns.

13. Highway Map (Figure 42)

This map shows the location and types of all highways and terminals in the city. In addition, it indicates the amount of peak-hour congestion and the value ratio of each segment of road.

14. Total Planning and Zoning Land and Institutional Land Map (Figure 43)

For each parcel, the number on top is the percent of the parcel owned by Planning and Zoning (public institutional plus parkland). The lower number is the percent of parcel in public institutional use only.

FIGURE 41

```
*.*************************************************************************************************************
         C I T Y   M O D E L     S A M P L E   O U T P U T                    *
                        HIGHWAY DEPARTMENT REPORT                                 JURISDICTION 1      ROUND  3
*.*************************************************************************************************************


F I N A N C I A L   R E P O R T
-------------------------------

                    CAPITAL                                                   CURRENT
                    -------                                                   -------


   PREVIOUS BALANCE            $22900000.00              PREVIOUS BALANCE            $     1334.00


   REVENUES                                              REVENUES
        APPROPRIATIONS         $25000000.00                   APPROPRIATIONS         $   500000.00
        FEDERAL/STATE AID               .00
        NEW BONDING                     .00                   NEW BONDING               1560000.00
        MISCELLANEOUS                   .00                   MISCELLANEOUS                    .00
   TOTAL REVENUE               $25000000.00              TOTAL REVENUE               $  2060000.00


   EXPENDITURES                                          EXPENDITURES
        ROAD CONSTRUCTION      $        .00                   ROAD MAINTENANCE       $   281599.00
        TERMINAL CONSTRUCTION           .00                   BOND PAYMENTS             1770000.00
        LAND PURCHASE                   .00
        MISCELLANEOUS                   .00                   MISCELLANEOUS                    .00
   TOTAL EXPENDITURES          $        .00              TOTAL EXPENDITURES          $  2051599.00


   NEW BALANCE               $ 47900000.00               NEW BALANCE               $        9735.00


                         OUTSTANDING BONDS
                         -----------------


   TYPE          ORIGINAL     REMAINING    INTEREST         ANNUAL
                 PRINCIPAL      TERM         RATE           PAYMENT
   ----          ---------    ---------    --------         -------

   CAPITAL        5000000.       11           5.0            350000.
   CURRENT          90000.        6           3.2             40000.
   CURRENT        2030000.        1           3.7           1380000.
   CURRENT        1500000.        2           3.3            810000.


M A I N T E N A N C E

---------------------


        ROAD        MAINTENANCE        TOTAL        AVERAGE DEPRECIATION              COST
        TYPE           LEVEL           MILES        BEFORE MAINTENANCE          -------------
        ----        -----------        -----        --------------------


          1            65.0              14                 .6                $          0.
          2            80.0              11                 .6                $          0.
          3           100.0              12                 .4                $     281600.


R O A D   C O N D I T I O N S
-----------------------------

        VALUE RATIO   ROADS
                 *
        ****************************************************************************************************
                 *
        90 - 80  :  9130  8732  9130  8730  9027  9128  9227  9027  8728  8827  9526
                 *
        ****************************************************************************************************
                 *

        THERE ARE NO ROADS IN THIS JURISDICTION WITH VALUE RATIOS BELOW 80



N E W   R O A D S
-----------------

        N O N E

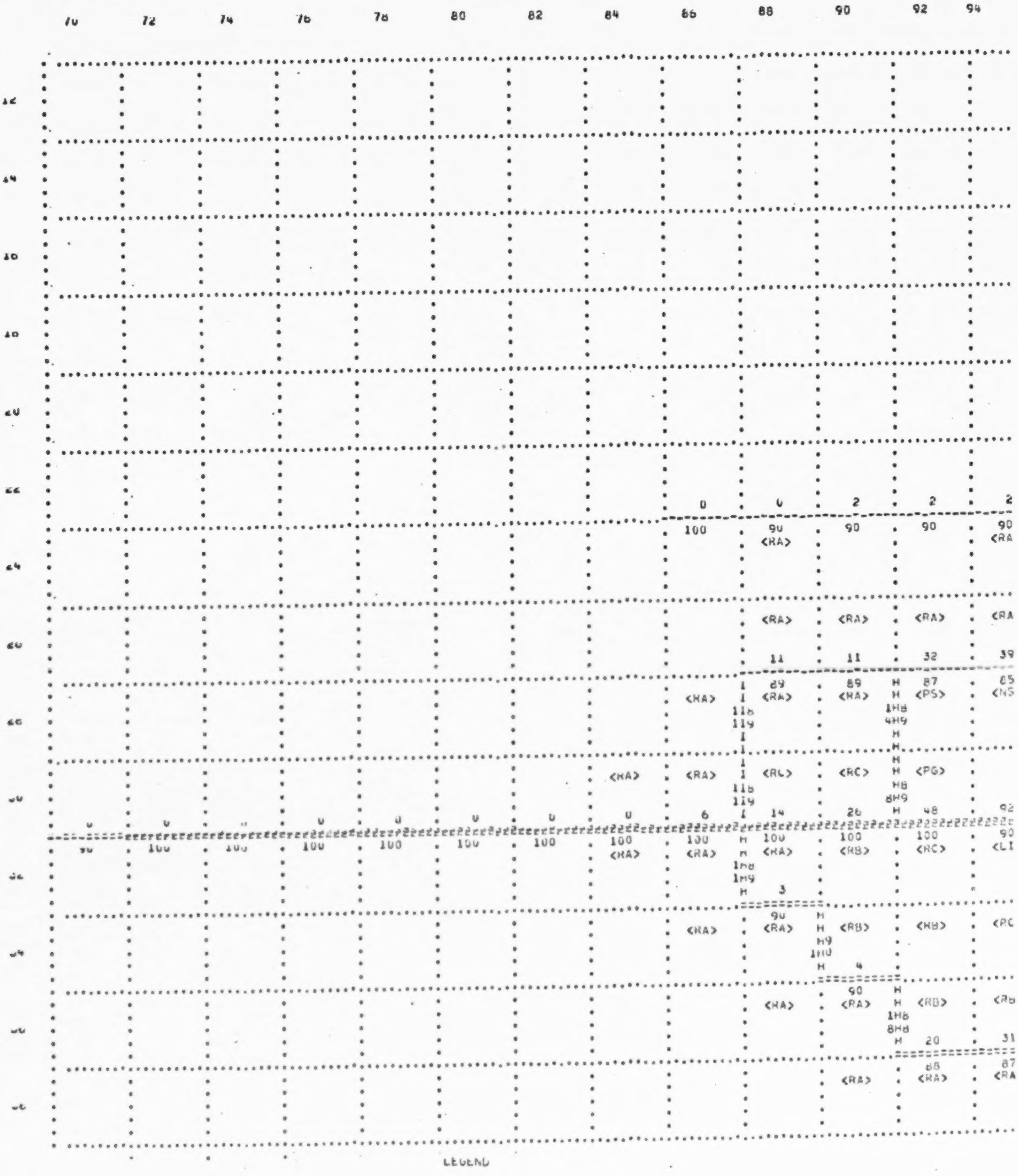


U N D E V E L O P E D   L A N D
-------------------------------

        LOCATION  AMOUNT     LOCATION  AMOUNT     LOCATION  AMOUNT     LOCATION  AMOUNT     LOCATION  AMOUNT
        --------  ------     --------  ------     --------  ------     --------  ------     --------  ------
          8822      48         8022      48         9022      48         9222      48         8024      48
          8824      48         9024      48         9224      48         9424      48


FEDERAL/STATE AID AVAILABLE FOR HIGHWAY CONSTRUCTION
----------------------------------------------------
```

HIGHWAY MAP FIGURE 42



```
                                  LEGEND

        EAST-WEST ROADS                              NORTH-SOUTH ROADS

   FORM                                         FORM

                                                  X
    .PP        P = PEAK CONGESTION              PXV        P = PEAK CONGESTION
 AA.AAAAAAA    A = ROAD TYPE                    PXV        A = ROAD TYPE
    .VV        V = VALUE RATIO                   X         V = VALUE RATIO

   WHERE ROAD TYPES ARE:                        WHERE ROAD TYPES ARE:

   ...    ROADBED                               ...    ROADBED
   ---    TYPE 1                                III    TYPE 1
   ===    TYPE 2                                HHH    TYPE 2
   ###    TYPE 3                                BBB    TYPE 3
```

```
 X
 XX    TERMINALS LEVEL N                        <XX>    LAND USE OF PARCEL
 X
```

FIGURE 43

```
**************************************************************************
            TWOCITY
  TOTAL PLANNING AND ZONING LAND AND INSTITUTIONAL LAND MAP
**************************************************************************


        T O T A L   L A N D   M A P   K E Y
        -----------------------------------

  TOP NUMBER    : TOTAL PERCENT OF PARCEL OWNED BY PLANNING AND ZONING

  BOTTOM NUMBER: PERCENT OF PARCEL WHICH IS PUBLIC INSTITUTION



       70   72   74   76   78   80   82   84   86   88   90   92   94   96   98
    .........................................................................
    .
 12.   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
    .
 14.   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
    .
 16.   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
    .
 18.   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
    .
 20.   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
    .
 22.   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
    .
 24.   --   --   --   --   --   --   --   --   --   --   --   --   --   48   --
    .
 26.   --   --   --   --   --   --   --   --   --   --   24   52   48   --   --
                                                         8    4    4
    .
 28.   --   --   --   --   --   --   --   --   --   --   52   --   --   --   --
    .
 30.   --   --   --   --   --   --   --   --   --   48   24   --   --   --   --
    .
 32.   --   --   --   --   --   --   --   --   --   36   --   --   --   --   --
    .
 34.   --   --   --   --   --   --   --   --   --   40   48   24   52   60   --
    .
 36.   --   --   --   --   --   --   --   --   --   --   --   48   48   --   --
    .
 38.   --   --   --   --   --   --   --   --   --   --   --   48   40   32   48
                                                                        20
    .
 40.   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
    .
```

15. Parkland Map (Figure 44)

This map is for the Planning and Zoning Department and shows the percentage of parkland on a given parcel (top number) and the total amount of time units (in hundreds) consumed by population units using that park (bottom number).

16. Zoning Code Map (Figure 45)

This map shows the specified zoning classification for each zoned parcel in the city. Parcels without numbers on them have not been zoned by the Zoning Department.

The zoning classifications are:

	Classification
Any Use	00 or --
Any Business	10
Any Industry	20
Heavy Industry	21
Light Industry	22
Construction Industry	23
Any Commercial	30
National Service	31
Business Goods	32
Business Services	33
Personal Goods	34
Personal Services	35
Any Residential	40
Single Family	41
Townhouse	42
Highrise	43
Parkland	50

17. Planning and Zoning Detail (Figure 46)

This output indicates:

a. Population - total population of the specified jurisdiction.

b. Total Parkland - the amount of parkland owned by the Planning and Zoning Department.

FIGURE 44

PARKLAND MAP

```
       70   72   74   76   78   80   82   84   86   88   90   92   94   96   98  100  102
  ..........................................................................................
  .
 12.   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
  .
 14.   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
  .
 16.   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
  .
 18.   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
  .
 20.   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
  .
 22.   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
  .
 24.   --   --   --   --   --   --   --   --   --   --   --   --   --   40   --   --   22
  .                                                                   66
 26.   --   --   --   --   --   --   --   --   --   --   24   52   48   --   --   --   22
  .                                                        45   32   48
 28.   --   --   --   --   --   --   --   --   --   --   52   --   --   --   --   --   22
  .                                                        47
 30.   --   --   --   --   --   --   --   --   --   36   24   --   --   --   --   --   22
  .                                                  120   54
 32.   --   --   --   --   --   --   --   --   --   36   --   --   --   --   --   --   22
  .                                                   55
 34.   --   --   --   --   --   --   --   --   --   40   24   24   52   16   --   --   --
  .                                                   58   69  408 1272  103
 36.   --   --   --   --   --   --   --   --   --   --   --   48   48   --   --   --   --
  .                                                             64  192
 38.   --   --   --   --   --   --   --   --   --   --   --   48   40   28   48   --   --
  .                                                             65   84  144  264
 40.   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
  .
 42.   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
  .
 44.   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
  .
 46.   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
  .
 48.   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
  .
 50.   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
  .
 52.   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
  .
 54.   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
  .
 56.   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
  .
 58.   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
  .
 60.   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
  .

  ..........................................................................................
       70   72   74   76   78   80   82   84   86   88   90   92   94   96   98  100  102


                                              P A R K L A N D   M A P   K E Y
                                              -------------------------------

 22            :  NO PARK FACILITIES FOR RESIDENTS
 TOP NUMBER    :% PARKLAND ON PARCEL
 BOTTOM NUMBER:   PARK USAGE/100
```

FIGURE 45

```
ZONING CODE MAP

      70   72   74   76   78   80   82   84   86   88   90   92   94   96   98  100  102
 .... ............................................................................
     .
 12. --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
     .
 14. --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
     .
 16. --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
     .
 18. --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
     .
 20. --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
     .
 22. --   --   --   --   --   --   --   --   --   --   --   --   40   40   40   40   --
     .
 24. --   --   --   --   --   --   --   --   --   --   --   --   40   40   40   40   40
     .
 26. --   --   --   --   --   --   --   --   --   41   41   41   40   --   30   40   40
     .
 28. --   --   --   --   --   --   --   --   41   41   41   30   30   20   20   40   40
     .
 30. --   --   --   --   --   --   --   40   41   40   40   30   --   20   30   40   40
     .
 32. --   --   --   --   --   --   --   40   40   40   40   40   20   20   30   40   40
     .
 34. --   --   --   --   --   --   --   --   40   40   40   40   40   --   40   --   --
     .
 36. --   --   --   --   --   --   --   --   --   40   40   40   40   40   40   --   --
     .
 38. --   --   --   --   --   --   --   --   --   --   40   41   41   41   41   --   --
     .
 40. --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
     .
 42. --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
     .
 44. --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
     .
 46. --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
     .
 48. --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
     .
 50. --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
     .
 52. --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
     .
 54. --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
     .
 56. --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
     .
 58. --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
     .
 60. --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --   --
     .

 .................................................................................
      70   72   74   76   78   80   82   84   86   88   90   92   94   96   98  100  102


                              ZONING MAP KEY

                                30 ANY NON-MANUFACTURING BUSINESS   40 ANY RESIDENTIAL
 - ANY USE                      31 NS                               41 RA
 1 ANY NON-RESIDENTIAL          32 BG                               42 RB
 20 ANY MANUFACTURING           33 BS                               43 RC
 2 HI                           34 PG                               50 PARKLAND
 2 LI                           35 PS
 23 CI
```

FIGURE 46

```
*******************************************************************
             CITY MODEL          SAMPLE OUTPUT
                 PLANNING AND ZONING DEPT.
*******************************************************************

          THE POPULATION IS 126000

          TOTAL PARKLAND IS 3.96 SQUARE MILES

          TOTAL INSTITUTIONAL LAND IS 1.26 SQUARE MILES

          POPULATION PER SQUARE MILE OF INSTITUTIONAL LAND IS 100,000

          NATIONAL AVERAGE IS 4000



          THERE ARE NO OUTSTANDING BONDS


                      FINANCIAL ACCOUNTING


          PREVIOUS CASH BALANCE                      0.

          REVENUES
              APPROPRIATIONS                   2000000.
              BONDING                                0.
              FED/STATE AID                          0.
              MISCELLANEOUS                          0.

                                               ________
          TOTAL                                2000000.


          EXPENDITURES
              PUBLIC INSTITUTIONS                    0.
              BOND PAYMENTS                          0.
              LAND PURCHASE                          0.
              MISCELLANEOUS                          0.
                                               ________
          TOTAL                                      0.


          NEW CASH BALANCE                     2000000.
```

c. Outstanding Bonds - the types, remaining term, interest rate, annual payment and principal of all bonds owed by the department.

d. Financial Accounting - the total current revenues and expenditures of the department.

18. Utility Map (Figure 47)

This map gives the location of each utility plant (the parcel is surrounded by asterisks); the parcels served by each numerically designated plant (upper number); and the level of utility service supplied to each parcel (lower number).

19. Utility Department Detail (Figure 48)

This output shows the following things for the Utility Department of each jurisdiction.

a. Units - the numerical designation, location, development level, utility units installed, utility units served (provided), total operating costs, operating costs per utility unit, and income for each utility plant.

b. Charges to Customers - the price (determined by Utility Department) for one unit of utility service.

c. Undeveloped Land - the amount and location of undeveloped land owned by the department.

d. Outstanding Bonds - the remaining term, interest rate, annual payment and principal on all outstanding bonds owed by the department.

e. Financial Accounting - the current and capital expenditures and revenues of the department.

20. Bus Company Report (Figure 49)

This output gives the basic information necessary for the operation of the Bus Company and shows the current operating status of the bus routes.

a. Financial Report - summary of the capital and current expenditures and revenues for the round.

b. Outstanding Bonds - the number, type, remaining term and annual payment on bonds which the Bus Company has outstanding. Capital bonds have a term of 25 years and are input by the player; current bonds have a term of 2 years

FIGURE 47

```
*.********************************************************************************************************
                       C I T Y  M O D E L     S A M P L E   O U T P U T
                       U T I L I T Y   M A P                   ROUND 3
**.*****************************************************************************************************
     70  72  74  76  78  80  82  84  86  88  90  92  94  96  98 100 102 104 106 108 110 112 114 116 118
**** *******************************************************************************************************
  *I  1   1   1   1   1   1   1   1   1   1   1   1   1 I 2   2   2   2   2   2   2   2   2   2   2   2I
12*I  ..  0   0   0   0   0   0   0   0   0   0   0   0 I 0   0   0   0   0   0   0   0   0   0   0   0I.12
  *I                                                    I                                              I

  *I  1   1   1   1   1   1   1   1   1   1   1   1   1 I 2   2   2   2   2   2   2   2   2   2   2   2I
14*I  ..  0   0   0   0   0   0   0   0   0   0   0   0 I 0   0   0   0   0   0   0   0   0   0   0   0I.14
  *I                                                    I                                              I

  *I  1   1   1   1   1   1   1   1   1   1   1   1   1 I 2   2   2   2   2   2   2   2   2   2   2   2I
16*I  ..  0   0   0   0   0   0   0   0   0   0   0   0 I 0   0   0   0   0   0   0   0   0   0   0   0I.16
  *I                                                    I                                              I

  *I  1   1   1   1   1   1   1   1   1   1   1   1   1 I 2   2   2   2   2   2   2   2   2   2   2   2I
18*I  ..  0   0   0   0   0   0   0   0   0   0   0   0 I 0   0   0   0   0   0   0   0   0   0   0   0I.18
  *I                                                    I                                              I

  *I  1   1   1   1   1   1   1   1   1   1   1   1   1 I 2   2   2   2   2   2   2   2   2   2   2   2I
20*I  ..  0   0   0   0   0   0   0   0   0   0   0   1 I 1   0   0   0   2   0   0   0   0   0   0   0I.20
  *I                                                    I                                              I

  *I  1   1   1   1   1   1   1   1   1   1   1   1   1 I 2   2   2   2   2   2   2   2   2   2   2   2I
22*I  ..  0   0   0   0   0   0   0   1   1   1   1   1 I 1   1   1   0   0   0   0   0   0   0   0   0I.22
  *I                                                    I                                              I

  *I  1   1   1   1   1   1   1   1   1   1   1   1 **1*I 2   2   2   2   2   2   2   2   2   2   2   2I
24*I  ..  0   0   0   0   0   0   0   1   1   1   3 * 1*I 1   2   1   1   0   0   0   0   0   0   0   0I.24
  *I                                               *****I                                              I

  *I  1   1   1   1   1   1   1   1   1   1   1   1   1 I 2   2   2   2   2   2   2   2   2   2   2   2I
26*I  ..  0   0   0   0   0   0   3   0   1   1   1   1 I 0   2   1   1   0   0   1   0   0   0   0   0I.26
  *I                                                    I                                              I

  *I  1   1   1   1   1   1   1   1   1   1   1   1   1 I 2   2   2   2   2   2   2   2   2   2   2   2I
28*I  ..  0   0   0   0   2   0   0   1   7   1   2   2 I 6   3   1   1   1   1   1   1   0   0   0   0I.28
  *I                                               =====I                                              I

  *I  .   1   1   1   1   1   1   1   1   1   1   1 I*2*  2   2   2   2   2   2   2   2   2   2   2   2I
30*I  ..  0   0   0   0   0   1   1   1   4   3   2 I 0*  6   2   1   1   1   1   2   2   0   0   0   0I.30
  *I                                                I****                                              I

  *I  1   1   1   1   1   1   1   1   1   1   1   1 I 2   2   2   2   2   2 **3*  3   3   2   2   2   2I
32*I  ..  0   0   0   0   0   1   1   1   1   2   3 I 3   6   2   1   1   1 * 1*  2   2   0   0   0   0I.32
  *I                                                I                      *****                       I

  *I  1   1   1   1   1   1   1   1   1   1   1   1 I 2   2   2   2   2   2   2   2   2   2   2   2   2I
34*I  ..  0   0   0   0   0   0   0   1   1   2   2 I 2   6   6   0   0   0   0   1   1   0   0   0   0I.34
  *I                                           =====I                                                  I

  *I  1   1   1   1   1   1   1   1   1   1   1 I 2   2   2   2   2   2   2   2   2   2   2   2   2   2I
36*I  .   0   0   0   0   0   0   0   0   1   1 I 2   2   2   2   2   0   0   0   0   0   0   0   0   0I.36
  *I                                            I                                                      I

  *I  1   1   1   1   1   1   1   1   1   1   1 I 2   2   2   2   2   2   2   2   2   2   2   2   2   2I
38*I  ..  0   0   0   0   0   0   0   0   0   1 I 1   1   1   1   0   0   0   0   0   0   0   0   0   0I.38
  *I                                            I                                                      I

  *I  1   1   1   1   1   1   1   1   1   1   1 I 2   2   2   2   2   2   2   2   2   2   2   2   2   2I
40*I  ..  0   0   0   0   0   0   0   0   0   0 I 0   1   1   0   0   0   0   0   0   0   0   0   0   0I.40
  *I                                            I                                                      I

  *I  1   1   1   1   1   1   1   1   1   1   1 I 2   2   2   2   2   2   2   2   2   2   2   2   2   2I
42*I  ..  0   0   0   0   0   0   0   0   0   0 I 0   0   0   0   0   0   0   0   0   0   0   0   0   0I.42
  *I                                            I                                                      I

  *I  1   1   1   1   1   1   1   1   1   1   1 I 2   2   2   2   2   2   2   2   2   2   2   2   2   2I
44*I  ..  0   0   0   0   0   0   0   0   0   0 I 0   0   0   0   0   0   0   0   0   0   0   0   0   0I.44
  *I                                            I                                                      I

  *I  1   1   1   1   1   1   1   1   1   1   1 I 2   2   2   2   2   2   2   2   2   2   2   2   2   2I
46*I  ..  0   0   0   0   0   0   0   0   0   0 I 0   0   0   0   0   0   0   0   0   0   0   0   0   0I.46
  *I                                            I                                                      I

  *I  1   1   1   1   1   1   1   1   1   1   1 I 2   2   2   2   2   2   2   2   2   2   2   2   2   2I
48*I  ..  0   0   0   0   0   0   0   0   0   0 I 0   0   0   0   0   0   0   0   0   0   0   0   0   0I.48
  *I                                            I                                                      I

  *I  1   1   1   1   1   1   1   1   1   1   1 I 2   2   2   2   2   2   2   2   2   2   2   2   2   2I
50*I  ..  0   0   0   0   0   0   0   0   0   0 I 0   0   0   0   0   0   0   0   0   0   0   0   0   0I.50
  *I                                            I                                                      I

  *I  1   1   1   1   1   1   1   1   1   1   1 I 2   2   2   2   2   2   2   2   2   2   2   2   2   2I
52*I  ..  0   0   0   0   0   0   0   0   0   0 I 0   0   0   0   0   0   0   0   0   0   0   0   0   0I.52
  *I                                            I                                                      I

  *I  1   1   1   1   1   1   1   1   1   1   1 I 2   2   2   2   2   2   2   2   2   2   2   2   2   2I
54*I  .   0   0   0   0   0   0   0   0   0   0 I 0   0   0   0   0   0   0   0   0   0   0   0   0   0I.54
  *I                                            I                                                      I

  *I  1   1   1   1   1   1   1   1   1   1   1 I 2   2   2   2   2   2   2   2   2   2   2   2   2   2I
56*I  .   0   0   0   0   0   0   0   0   0   0 I 0   0   0   0   0   0   0   0   0   0   0   0   0   0I.56
  *I                                            I                                                      I

  *I  1   1   1   1   1   1   1   1   1   1   1 I 2   2   2   2   2   2   2   2   2   2   2   2   2   2I
58*I  ..  0   0   0   0   0   0   0   0   0   0 I 0   0   0   0   0   0   0   0   0   0   0   0   0   0I.58
  *I  .                                         I                                                      I

  *I  1   1   1   1   1   1   1   1   1   1   1 I 2   2   2   2   2   2   2   2   2   2   2   2   2   2I
60*I  .   0   0   0   0   0   0   0   0   0   0 I 0   0   0   0   0   0   0   0   0   0   0   0   0   0I.60
  *---=---=-----===========================================================================================

.*********************************************************************************************************
     70  72  74  76  78  80  82  84  86  88  90  92  94  96  98 100 102 104 106 108 110 112 114 116 118

          ASTERISKS ENCIRCLE UTILITY PLANTS
          TOP NUMBER:  CODE NUMBER OF PLANTS SERVING PARCEL
          BOTTOM NUMBER:  LEVEL OF UTILITY SERVICE ON PARCEL
```

FIGURE 48

```
*****************************************************************************************************************
              C I T Y   M O D E L      S A M P L E   O U T P U T
                  U T I L I T Y   D E P A R T M E N T                                    JURISDICTION 1     ROUND  3
*****************************************************************************************************************

                                  UNITS           UNITS       OPERATING      OPERATING
PLANT     LOCATION     LEVEL     INSTALLED        SERVED         COSTS        COST/UNIT              INCOME
-------------------------------------------------------------------------------------------------------------

  4        94-24         1         6500            1150        9222222.           8019.          11500000.

                                                  TOTALS       9222222.                          11500000.
CHARGE TO CUSTOMERS --      10000 PER UNIT


                                OUTSTANDING BONDS
                                -----------------


    TYPE              ORIGINAL     REMAINING     INTEREST          ANNUAL
                      PRINCIPAL      TERM          RATE            PAYMENT
    ----              ---------    ---------     --------          -------

  CAPITAL             15000000.      7              4.1             970000.



*****************************************************************************************************************
              C I T Y   M O D E L      S A M P L E   O U T P U T
                              UTILITY DEPT. FINANCES                                     JURISDICTION 1     ROUND  3
*****************************************************************************************************************



                         FINANCIAL ACCOUNTING

      CAPITAL                                            CURRENT
PREVIOUS CASH BALANCE          4900270.      PREVIOUS CASH BALANCE        2607856.

REVENUES                                     REVENUES
     SUBSIDIES                      0.          SUBSIDIES                      0.
     BONDING                        0.          BONDING                        0.
     MISC. INCOME                   0.          MISC. INCOME                   0.
                                                INCOME FROM USERS      11500000.


                              -------                                  -------
TOTAL                               0.       TOTAL                    11500000.


EXPENDITURES                                 EXPENDITURES
     PLANT CONSTRUCTION             0.          OPERATING COSTS         9222222.
     MISCELLANEOUS                  0.          MISCELLANEOUS                 0.
     EXTENSION OF SERVICE           0.          BOND PAYMENTS            970000.
     LAND PURCHASE                  0.


                              -------                                  -------
TOTAL                               0.       TOTAL                    10192222.


NEW CASH BALANCE               4900270.      NEW CASH BALANCE          3915634.
```

FIGURE 49

```
*.*********************************************************************************************************
          C I T Y   M O D E L       S A M P L E   O U T P U T                                     ROUND  3
                          BUS COMPANY REPORT
*.*********************************************************************************************************


F I N A N C I A L   R E P O R T
-------------------------------
                                                                          CURRENT
                   CAPITAL                                                -------
                   -------

                                                            PREVIOUS BALANCE             $        9900.
    PREVIOUS BALANCE               $  40736100.

                                                            REVENUES
    REVENUES                                                     SUBSIDIES               $           0.
         SUBSIDIES                 $          0.                 NEW BONDING                   4680000.
         NEW BONDING                          0.                 FARES                         1577600.
                                                                 MISCELLANEOUS                       0.
         MISCELLANEOUS                        0.            TOTAL REVENUE                $     6257600.
    TOTAL REVENUE                  $          0.

                                                            EXPENDITURES
    EXPENDITURES                                                 VEHICLE MAINTENANCE     $     1092000.
         VEHICLE PURCHASE          $          0.                 MISCELLANEOUS                       0.
         MISCELLANEOUS                        0.                 SALARIES                      1632000.
                                                                 BOND PAYMENTS                 3540000.
    TOTAL EXPENDITURES             $          0.            TOTAL EXPENDITURES           $     6264000.


    NEW BALANCE                    $  40736100.             NEW BALANCE                  $        3500.

                        OUTSTANDING BONDS
                        -----------------

  TYPE          ORIGINAL      REMAINING     INTEREST          ANNUAL
                PRINCIPAL       TERM          RATE            PAYMENT
  ----          ---------     ---------     --------          -------

 CAPITAL        14000000.        9             4.8             970000.
 CURRENT          790000.        0             3.2             410000.
 CAPITAL         1000000.       24             3.2              50000.
 CURRENT         4020000.        1             3.5            2110000.
 CURRENT         4680000.        2             3.1            2440000.


E M P L O Y M E N T
-------------------
          EMPLOYEES       SALARY        EMPLOYEES        SALARIES
          REQUESTED       OFFERED       RECEIVED           PAID
          ---------       -------       -----------

             320           5100            320      $    1632000
           2 UNITS                       2 UNITS


R O L L I N G   S T O C K
-------------------------

          UNITS      UNITS      MAINTENANCE       MAINTENANCE COST         AVERAGE       SERVICEABLE
          OWNED      IN USE        LEVEL          GOODS / SERVICES        VALUE RATIO       UNITS
          ------     ------     -----------     -------------------     -----------    -----------

          1170       1040          100%         364000.    728000.        100.0           1170
```

FIGURE 49 (Continued)

```
T R A N S I T   S U M M A R Y
-------------------------------

        FARES
        -----

            FARES HAVE BEEN SET AT 10 CENTS, PLUS  3 CENTS PER MILE.

        PASSENGERS
        ----------

            ROUTE     LEVEL OF      MILES     PERSONNEL      UNITS        TOTAL       AVERAGE TRIP       TOTAL
            NUMBER    SERVICE                 REQUIRED      REQUIRED    PASSENGERS       (MILES)          FARES
            ------    --------      -----     ---------     --------    ----------    ------------       -----

                                                                                                     $  744600
             101         2            5          80           400          9120           2.1        $  554800
             102         1            7          56           280          5000           4.1        $  278200
             104         1            3          24           120          3920           1.4        $        0
             105         1            6          48           240             0            .0

                                                                                                     $ 1577600
            TOTAL                    21         208          1040         18040


R O U T E S
-----------

      ROUTE NUMBER     STOPS
      ------------     -----




         101            8531 -->-->-->--  8731 -->-->-->--  8931 -->-->-->--  9131 -->-->-->--  9331 -->-->-->
                        0  1080  1080   360   840  1560     0   160  1720  1120  7040  7640   400     0  7240

                    --  9531
                     7240     0     0
         102            8731 -->-->-->--  8729 -->-->-->--  8727 -->-->-->--  8927 -->-->-->--  9127 -->-->-->
                        0   600   600     0  2080  2680     0   240  2920     0  1760  4680  1000   160  3840

                    --  9327 -->-->-->--  9527 -->-->-->--  9727
                      400   160  3600  1600     0  2000  2000     0     0
         104            9537 -->-->-->--  9535 -->-->-->--  9533 -->-->-->--  9531
                        0   960   960     0  1400  2360  1760  1560  2160  2160     0     0
         105            9723 -->-->-->--  9523 -->-->-->--  9525 -->-->-->--  9527 -->-->-->--  9529 -->-->-->
                        0     0     0     0     0     0     0     0     0     0     0     0     0     0     0

                    --  9531 -->-->-->--  9731
                        0     0     0     0     0     0

    LEGEND:    -- SSSSS*-->-->-->       SSSSS   IS INTERSECTION OF STOP,            *    IF LAST STOP IN ZONE
               FFFFF NNNNN PPPPP        FFFFF   IS NUMBER OF PEOPLE GETTING OFF,     NNNNN   IS NUMBER OF PEOPLE GETTING ON
                                        PPPPP   IS NUMBER OF PASSENGERS ON VEHICLE BETWEEN STOPS
```

and are floated automatically by the computer when current expenditures exceed current revenues; all interest rates are determined by the computer and payment begins in the round after the bond is floated.

c. Employment - indicates the number of employees requested both in number of workers and number of population units (BUS hires in increments of PM's), the salary offered per worker, number of workers received (if salary is too low the Bus Company may not obtain all of the employees requested), and total salaries paid to all employees.

d. Rolling Stock - indicates the number of units presently owned, units in use, maintenance level, maintenance costs, average value ratio, and serviceable units.

Units Owned x Value Ratio = Serviceable Units

Units in Use = Units Required (if Units in Use is equal to or less than Units Owned).

e. Transit Summary - indicates fares set by the Bus Company on either a base cost or a base cost plus mileage basis. Also presents information on each route as to level of service, length, personnel and equipment required, total passengers (including transfer passengers), and average length of trip.

f. Routes - indicates, by route, where BUS stops, how many passengers got off at that stop, how many got on, and how many are riding to the next stop.

21. Rail Company Report (Figure 50)

The first six sections of the RAIL output are nearly identical to BUS output. There is in addition a section of output following "Routes" entitled "Undeveloped Land" which indicates the undeveloped land which is owned by the Rail Company and which can be used for surface track construction (RAIL can build track either on the surface or underground). All land purchased by RAIL and not used will be listed here by parcel location and percent of parcel owned.

22. Transportation Network Maps (Figure 51)

These maps summarize the three modes of transportation (bus, rail and highway) in the city. They should be used by the transportation decision-makers to plan their routes.

FIGURE 50

```
*.*************************************************************************************************************
          C I T Y  M O D E L     S A M P L E   O U T P U T
                         RAILROAD COMPANY REPORT                                                     ROUND  3
*.*************************************************************************************************************


F I N A N C I A L   R E P O R T
-------------------------------

                         CAPITAL                                                   CURRENT
                         -------                                                   -------


      PREVIOUS BALANCE             $  65659114.                 PREVIOUS BALANCE            $   9589000.


      REVENUES                                                  REVENUES
           SUBSIDIES               $          0.                     SUBSIDIES              $          0.
           NEW BONDING                        0.                     NEW BONDING                       0.
                                                                     FARES                        566800.
           MISCELLANEOUS                      0.                     MISCELLANEOUS                     0.
      TOTAL REVENUE                $          0.                TOTAL REVENUE               $     566800.


      EXPENDITURES                                              EXPENDITURES
           VEHICLE PURCHASE        $          0.                     VEHICLE MAINTENANCE    $          0.
           STATION CONSTRUCTION               0.                     SALARIES                     832000.
           TRACK CONSTRUCTION                 0.
           LAND PURCHASE                      0.
                                                                     BOND PAYMENTS                 50000.
           MISCELLANEOUS                      0.                     MISCELLANEOUS                     0.
      TOTAL EXPENDITURES           $          0.                TOTAL EXPENDITURES          $     882000.


      NEW BALANCE                  $  65659114.                 NEW BALANCE                 $   9273600.


                           OUTSTANDING BONDS
                           -----------------


   TYPE            ORIGINAL    REMAINING    INTEREST          ANNUAL
                   PRINCIPAL      TERM        RATE            PAYMENT
   ----            ---------   ---------    --------          -------

   CAPITAL          1000000.    24             3.2             50000.



E M P L O Y M E N T
-------------------

        EMPLOYEES       SALARY        EMPLOYEES        SALARIES
        REQUESTED       OFFERED       RECEIVED           PAID
        ---------       ---------     ------------


          160            5200           160       $     832000
        1 UNITS                       1 UNITS

R O L L I N G   S T O C K
-------------------------

        UNITS     UNITS     MAINTENANCE       MAINTENANCE COST        AVERAGE       SERVICEABLE
        OWNED     IN USE       LEVEL         GOODS / SERVICES       VALUE RATIO        UNITS
        ------    ------    -----------    --------------------    -----------    -----------

         200       200         90%                0.        0.         93.0            186
```

FIGURE 50 (Continued)

```
T R A N S I T   S U M M A R Y
------------------------------

        FARES
        -----

            FARES HAVE BEEN SET AT 20 CENTS, PLUS  2 CENTS PER MILE.

        PASSENGERS
        ----------

            ROUTE      LEVEL OF      MILES     PERSONNEL     UNITS       TOTAL       AVERAGE TRIP     TOTAL
            NUMBER     SERVICE                 REQUIRED     REQUIRED   PASSENGERS      (MILES)        FARES
            ------     --------      -----     ---------    --------   ----------   ------------      -----

             201          2            3          48           480         160           3.0         $   20800
             202          1            5          40           400        3640           5.0         $  546000

            TOTAL                      8          88           880        3800                       $  566800


R O U T E S
-----------

        ROUTE NUMBER     STOPS
        ------------     -----
            201           8729 -->-->-->--  9331
                           0   160   160   160     0     0




            202           9757 -->-->-->--  9727
                           0  3640  3640  3640     0     0

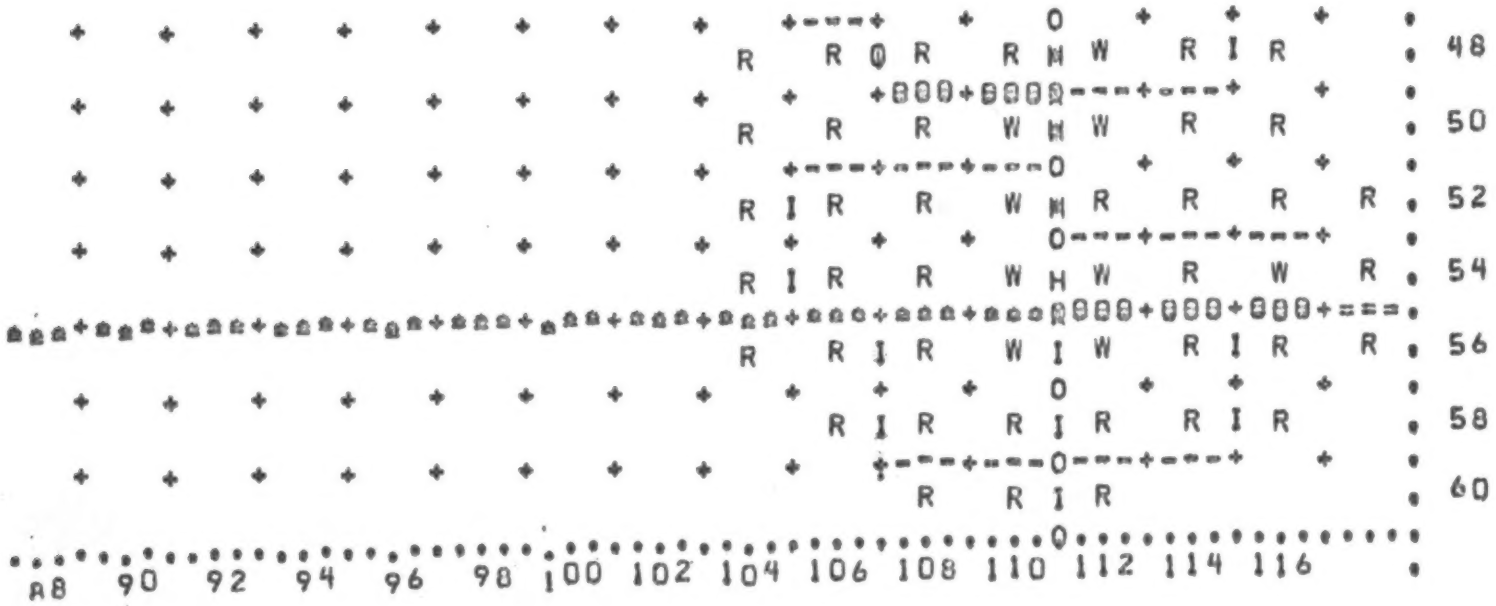
        LEGEND:   -- SSSSS*-->-->-->      SSSSS   IS INTERSECTION OF STOP,              *    IF LAST STOP IN ZONE
                  FFFFF NNNNN PPPPP       FFFFF   IS NUMBER OF PEOPLE GETTING OFF,     NNNNN   IS NUMBER OF PEOPLE GETTING ON
                                          PPPPP   IS NUMBER OF PASSENGERS ON VEHICLE BETWEEN STOPS

U N D E V E L O P E D   L A N D
-------------------------------

        LOCATION  AMOUNT    LOCATION  AMOUNT    LOCATION  AMOUNT    LOCATION  AMOUNT    LOCATION  AMOUNT
        --------  ------    --------  ------    --------  ------    --------  ------    --------  ------
          9254      4%
```

FIGURE 51

TRANSPORTATION NETWORK MAP ROUND 1


48
50
52
54
56
58
60
88
90
92
94
96
98
100
102
104
106
108
110
112
114
116

O TRACK PASSES THROUGH INTERSECTION . X STATION AT INTERSECTION
-I TYPE 1 ROAD =H TYPE 2 ROAD ■H TYPE 3 ROAD 0 BUS ROUTES
W WORK LOCATION R RESIDENTIAL LOCATION

LIST OF TRACK SEGMENTS

11119 TO 11317
11317 TO 11515
11515 TO 11713
11123 TO 11125
11125 TO 11127
11127 TO 11129
11135 TO 11137
11137 TO 11139
11139 TO 11141
11147 TO 11149
11149 TO 11151
11151 TO 11153
11159 TO 11161

LIST OF STATIONS

11515 11119 11123 11127 11143 11149 11155

VI. INPUT PROCEDURE

Since CITY III is a computer-assisted model, it is necessary that information be fed to the computer in a certain format. This format is quite elementary and requires no knowledge of computer programming. It merely involves filling out forms properly with the required information for each decision.

A. Using Forms

In order to make a decision and feed it to the computer, participants in the CITY III game must complete an input decision form (See Figure C) with certain information. The information which is required on the input decision form varies with the type of decision being implemented. The type of information which is required is explained on the input explanation forms (see pages 196-219).

An input decision form has the following components: Decision Code, Decision-Maker, and additional information. Each of these components is explained below:

1. Decision Code

This indicates the type of decision that is being made. It is usually an abbreviation preceded by a dollar sign ($). Essentially, the decision code describes the type of decision being made to the computer. They correspond to the codes listed in parentheses next to the explanation of decisions in the preceding chapters of this manual. These codes are summarized below for all decision-makers.

a. $CVPT - Change SC or MS employment; change zoning; establish utility service level; change maintenance levels; change economic sector rents, prices, salaries; award BG and BS contracts.

b. $PU - Bid and/or purchase land and developments from another team or from the outside.

c. $OTHER - Set government salaries; float capital bonds; change maintenance levels; lend or borrow money; buy or sell speculative or conservative stocks; set welfare payments; purchase or sell rail and bus rolling stock; set utility prices.

d. $BUILD - Construct, upgrade or demolish a development by the local Construction Industry.

INPUT DECISION FORM

FIGURE C

Note: When filling out this form, refer to input description form in the manual.

Please write clearly; distinguish between 1 (one) and 'I' (eye), 'Ø' (oh) and 0 (zero); be sure to fill in numbers exactly as required, omitting commas within numbers (100000).

Decision Code	Decision-Maker	a	b	c	d	e	f	g	h	i	j	k	l
$______ /	=______ /	______,	______,	______,	______,	______,	______,	______,	______,	______,	______,	______,	______
$______ /	=______ /	______,	______,	______,	______,	______,	______,	______,	______,	______,	______,	______,	______
$______ /	=______ /	______,	______,	______,	______,	______,	______,	______,	______,	______,	______,	______,	______
$______ /	=______ /	______,	______,	______,	______,	______,	______,	______,	______,	______,	______,	______,	______
$______ /	=______ /	______,	______,	______,	______,	______,	______,	______,	______,	______,	______,	______,	______
$______ /	=______ /	______,	______,	______,	______,	______,	______,	______,	______,	______,	______,	______,	______
$______ /	=______ /	______,	______,	______,	______,	______,	______,	______,	______,	______,	______,	______,	______
$______ /	=______ /	______,	______,	______,	______,	______,	______,	______,	______,	______,	______,	______,	______
$______ /	=______ /	______,	______,	______,	______,	______,	______,	______,	______,	______,	______,	______,	______
$______ /	=______ /	______,	______,	______,	______,	______,	______,	______,	______,	______,	______,	______,	______
$______ /	=______ /	______,	______,	______,	______,	______,	______,	______,	______,	______,	______,	______,	______
$______ /	=______ /	______,	______,	______,	______,	______,	______,	______,	______,	______,	______,	______,	______
$______ /	=______ /	______,	______,	______,	______,	______,	______,	______,	______,	______,	______,	______,	______
$______ /	=______ /	______,	______,	______,	______,	______,	______,	______,	______,	______,	______,	______,	______

e. $OUBLD - Construct, upgrade, or demolish a development by the Outside System.

f. $CASH - Transfer cash between accounts of two decision-makers; grant appropriations or subsidies.

g. $BYCT - Boycott work or shop locations or use of BUS or RAIL.

h. $TAXES - Set tax rates.

i. $FSA - Request capital federal-state aid.

j. $REDIST - Change school or municipal services districts.

k. $VALUE - Set the dollar value of time unit traveling.

l. $TIME - Allocate time for population units.

m. $ROUT - Change Bus or Rail routes.

n. $RAIL - Build rail lines and stations.

o. $ASMNT - Set assessment criteria.

2. Decision-Maker

This term identifies the decision-maker who is implementing a decision. The decision-maker codes for the economic sector are A, B, C, etc. The decision-maker identification codes for the governmental sector are: CH (Chairman); AS (Assessment); SC (Schools); MS (Municipal Services); HY (Highway); PZ (Planning and Zoning); UT (Utilities); RAIL (Rapid Rail); and BUS (Bus). Governmental decision-makers (except BUS and RAIL) must identify their jurisdiction when filling in the form. For example, "CH1" would indicate the Chairman in Jurisdiction 1.

3. Additional Information

The additional information concerning a decision is filled in the spaces immediately following the decision-maker identification. These spaces correspond to the columns marked (a), (b), (c), etc., on the input decision form. The amount and type of additional information varies with the type of decision being made.

To clarify this procedure, the reader should review the sample decisions made in Figure D following.

SAMPLE DECISIONS

1. The School Department in jurisdiction 1 changes salaries to $6,500 for PM teachers and $11,500 for PH teachers.

Decision Code	Decision-Maker	a	b	c	d	e	f	g	h	i	j	k	l
$ OTHER /	= SC1 /	S	65	115									

2. Economic decision-maker A lends one million dollars to E. The term of the loan is 25 years and the interest rate is 6 percent.

Decision Code	Decision-Maker	a	b	c	d	e	f	g	h	i	j	k	l
$ OTHER /	= A /	LO	100	25	60	E							

3. Economic decision-maker G invests $100,000 in speculative stocks.

Decision Code	Decision-Maker	a	b	c	d	e	f	g	h	i	j	k	l
$ OTHER /	= G /	SP	100000										

4. Social decision-maker CC allocates time for high-income population units which he controls in jurisdiction 1. He allocates 25 time units each for extra work and adult education; and 20 time units each for politics and recreation.

Decision Code	Decision-Maker	a	b	c	d	e	f	g	h	i	j	k	l
$ TIME /	= CC /	H1	25	0	25	20	20						

FIGURE D

ECONOMIC DECISION-MAKERS: INPUT EXPLANATION FORM

Type of Decision	Code	Decision-Maker	a	b	c	d	e
Purchase or bid on land	$PU	A, B, C, etc.	location	price (in $1000's)	seller (economic decision-maker or department and jurisdiction or, if bid, OU)	if from department, percent of parcel	
Change Rents	$CVPT	A, B, C, etc.	R	location	new rent/PL1 (in $1000's)		
Change Prices	$CVPT	A, B, C, etc.	P	location	basic price/CU (in $100's)		
Change Salaries	$CVPT	A, B, C, etc.	S	location	salary to low income (specified as salary per worker in $100's)	salary to middle income (specified as salary per worker in $100's)	salary to high income (specified as salary per worker in $100's)
Change Maintenance Level	$CVPT	A, B, C, etc.	M	location	new maintenance level		
Lend Money	$OTHER	A, B, C, etc.	LO	amount (in $10,000's)	term (2 or 25)	interest rate (in mils)	borrower
Borrow Money from the Outside System	$OTHER	A, B, C, etc.	BO	amount (in $10,000's)	term (2 or 25)		

Type of Decision	Code	Decision-Maker	a	b	c	d	e
Invest in speculative stocks	$OTHER	A, B, C, etc.	SP	amount (in dollars)			
Invest in conservative stocks	$OTHER	A, B, C, etc.	CN	amount (in dollars)			
Sell speculative stocks	$OTHER	A, B, C, etc.	SELLSP	amount (in dollars)			
Sell conservative stocks	$OTHER	A, B, C, etc.	SELLCN	amount (in dollars)			
Build, upgrade, or demolish by Outside System	$OUBLD	A, B, C, etc.	site location	land use	Old level (0 if new new building	new level (0 if demolition)	maintenanc level
			f	g	h	i	
			if residence, quality index; if business, salary to low-income worker (in $100's)	if residence, 0; if business, salary to middle income worker (in 100's)	if residence, rent per PL1 (in $1000's); if business, salary to high income worker (in $100's)	if commercial (BG, BS, PG, PS), price/CU (in $100's)	

Type of Decision	Code	Decision-Maker	a	b	c	d	e	f
Build, upgrade, or demolish by local Construction Industry	$BUILD	CI owner	CI location	contractee (economic decision-maker or department and jurisdiction)	site location	land use (RA, RB, RC, HI, LI, NS, BG, BS, PG, PS, SC, HY, TM, MS)	old level (0, if new building)	new level (0, if demolition)
			g	h	i	j	k	l
			agreed price (in $100,000's)	maintenance level unless HY or TM; if HY or TM is on jurisdiction boundaries, list of jurisdictions separated by commas	if residence, quality index; if business, salary to low income worker (in $ $100's); if SC or MS, number of middle or low income Pl's employed there	if residence, 0; if business, salary to middle income worker (in $100's); if SC or MS, number of high or middle income Pl's working there	if residence, rent per PL1 (in $1000's); if business, salary to high income worker (in $100's)	if commercial (BG, BS, PG, PS) price/CU (in $100's)

Type of Decision	Code	Decision-Maker	a	b	c	d	e	f
Transfer cash	$CASH	A, B, C, etc.	C	receiver (economic decision-maker or department and jurisdiction)	amount (in dollars)	PVT	if economic decision-maker receiving, PVT; if department receiving, CAPital or CURrent account	
Boycott commercial establishments	$BYCT	A, B, C, etc.	E	land use boycotting	S	location boycotted	Stop the boycott or Begin it	

SOCIAL DECISION-MAKERS: INPUT EXPLANATION FORM

Type of Decision	Code	Decision Maker	a	b	c	d	e	f	g
Allocate time by jurisdiction, by class	$TIME	AA, BB, CC, etc.	class (H M, or L) and jurisdiction (1, 2, or 3)	time units in extra work; if none, 0	time units in public adult education if none,	time units in adult education; if none, 0	time units in politics; if none, 0	time units in recreation; if none, 0	
Allocate time by jurisdiction, by class, by parcel	$TIME	AA, BB CC, etc.	class (H, M, or L) and jurisdiction (1, 2, or 3)	time units in extra work; if none, 0	time units in public adult education if none	time units in adult education; if none, 0	time units in politics; if none, 0	time units in recreation; if none, 0	residence location
Boycott	$BYCT	AA, BB CC, etc.	S	class boycotting (H, M, or L)	function boycotted (Shop or Work or Use)	location boycotted (0 if department)	Stop the boycott or Begin it	if applicable, department (SC, MS) and jurisdiction (1, 2, or 3)	
Change dollar value of time for P1's	$VALUE	AA, BB CC, etc.	class (H, M, or L)	dollar value of time unit travelling					

CHAIRMAN & COUNCIL: INPUT EXPLANATION FORM

Type of Decision	Code	Decision Maker	a	b	c	d	e
Grant Capital Appropriations	$CASH	CH1, CH2 or CH3	CP	department receiving and jurisdiction	amount (in dollars)		
Grant Current Appropriations	$CASH	CH1, CH2 or CH3	CR	department receiving and jurisdiction	amount (in dollars)		
Grant Current Subsidy	$CASH	CH1, CH2 or CH3	CURS	department receiving and jurisdiction	amount (in dollars)		
Grant Capital Subsidy	$CASH	CH1, CH2 or CH3	CAPS	department receiving and jurisdiction	amount (in dollars)		
Transfer Cash	$CASH	CH1, CH2 or CH3	C	receiver (economic decision-maker or department and jurisdiction)	amount (in dollars)	CUR	if economic decision-maker receiving, PVT, if department receiving, to CAPital or CURrent account
Grant Subsidy to Economic Decision-Maker	$CASH	CH1, CH2 or CH3	SB	receiver	amount (in dollars)		

Type of Decision	Code	Decision Maker	a	b	c	d	e
Set Welfare Payments	$OTHER	CH1, CH2 or CH3	W	amount per unemployed worker (in $100's)			
Change land tax rate	$TAXES	CH1, CH2 or CH3	L	land tax rate (in mils)			
Change development tax rate	$TAXES	CH1, CH2 or CH3	D	development rate (in mils)			
Change resident (or employee) income tax rate	$TAXES	CH1, CH2 or CH3	RI (or EI)	resident (or employee) income (in mils)			
Change resident (or employee) auto tax rate	$TAXES	CH1, CH2 or CH3	RA (or EA)	resident (or employee) auto expenses (in mils)			
Change goods sales tax rate	$TAXES	CH1, CH2 or CH3	G	goods tax rate (in mils)			
Change services sales tax rate	$TAXES	CH1, CH2 or CH3	S	services tax rate (in mils)			
Float Capital Bonds	$OTHER	department receiving and jurisdiction	BO	amount (in $10,000's)	25		

ASSESSMENT DEPARTMENT: INPUT EXPLANATION FORM

Type of Decision	Decision Code	Decision Maker	a	b	c
Change Development Assessment Rates for all land uses jurisdiction-wide	$ASMNT	AS1,AS2 or AS3	D	Development Assessment Rate in tenths of a percent (i.e., "500" equals "50%")	
Change Development Assessment Rate for a particular land use	$ASMNT	AS1,AS2 or AS3	D and land use code (i.e., DH1 DLI, DNS, DCF, DBG, DBS, DPG, DPS, DRA, DRB, or DRC)	Development Assessment Rate in tenths of a percent (i.e., "500"equals "50%")	
Change Land Assessment Rate Jurisdiction-wide	$ASMNT	AS1, AS2 or AS3	L	Land Assessment Rate in tenths of a percent (i.e., "500" equals "50%")	

Type of Decision	Decision Code	Decision Maker	a	b	c	d	e
Change Land Assessment Rate for parcels with a particular land use	$ASMNT	ASI,AS2 or AS3	L and land use code (i.e. LHI, LLI, LNS, LCI, LBG, LBS, LPG, LPS, LRA, LRB, LRC, or LUL)[1]	Land Assessment Rate in tenths of a percent (i.e., "500" equals "50%")			
Define Special Zones[2]	$ASMNT	AS1,AS2 or AS3	SZ	zone number (1,2,3,4, etc.)	list of upper left and lower right intersections coordinates[3]		if any other special zone is to have same special rates as this, zone number here
Change Development or Land Assessment Rates within a Special Zone	$ASMNT	AS1,AS2 or AS3	Development or Land	Land or Development Assessment Rate in tenths of a percent (i.e., "500" equals "50%")	Zone number		

A

1. "UL" is the land use code for undeveloped land.
2. No special zones are carried from one round to the next, they must be re-defined each round before any special rates by zone are initiated.
3. Intersection coordinates are odd-numbered. Thus "9125, 9933" would include all parcels in the rectangle formed by parcel 9226 in the upper left hand corner and parcel 9832 in the lower right hand corner.

Type of Decision	Decision Code	Decision Maker	a	b	c	d
Change Development Assessment Rate for a particular land use or change Land Assessment rate for parcels with a particular land use within a special zone.	$ASMNT	AS1,AS2 or AS3	Development or Land and land use code (i.e., DHI, DLI, or LHI, LLI, etc.)	Land or Development Assessment Rate in tenths of a percent (i.e., "500" equals "50%")	Zone number	
Make Special Assessments for land and developments	$ASMNT	AS1,AS2 or AS3	SA	Location	Assessed value of land (in $100,000's)	Assessed Value of Developments (in $100,000's)

NOTE: After all assessment decisions are made, write "ASMNT/#AS1,2,or3/END" on the last line of the input decision form.

SCHOOL DEPARTMENT: INPUT EXPLANATION FORM

Type of Decision	Code	Decision-Maker	a	b	c	d	e	f
Purchase or bid on land	$PU	SC1, SC2, or SC3	location	price (in $1000's)	seller (economic decision-maker or department)	percent of parcel (0 if all)		
Change employment	$CVPT	SC1, SC2, or SC3	E	location	new number of PM units working there	new number of PH units working there		
Change maintenance level	$CVPT	SC1, SC2, or SC3	M	location	new maintenance level			
Change district boundaries	$REDIST	SC1, SC2, or SC3	location of school	list of new parcels in district in parentheses*				

*Parcels can be listed within parentheses by specifying upper left and lower right hand corners separated by " > ". Example:

$REDIST/=SC1/(9232 > 10040)

Type of Decision	Code	Decision-Maker	a	b	c	d	e	f	g
Request Federal-state aid	$FSA	SC1, SC2, or SC3	new level of school for which aid is requested (1, 2, or 3)	location					
Change salaries	$OTHER	SC1, SC2, or SC3	S	salary to middle income worker (in $100's)	salary to high income worker (in $100's)				
			a	b	c	d	e	f	g
Construct, upgrade or demolish a school by the "Outside System"	$OUBLD	SC1, SC2, or SC3	site location	SC	old level (0, if new building)	new level (0, if demolition)	new maintenance level	number of PM's working	number of PH's working there
			a	b	c	d	e	f	
Construct, upgrade or demolish a school by the local Construction Industry			[See CI owner]						

Type of Decision	Code	Decision-Maker	a	b	c	d	e	f
Transfer cash	$CASH	SC1, SC2, or SC3	C	receiver (economic decision-maker or department and jurisdiction)	amount (in dollars)	from CAPital or CURrent account	if economic decision-maker receiving, PVT; if department receiving, to CAPital or CURrent account	
Award BG or BS contracts	$CVPT	SC1, SC2, or SC3	C	location of BG or BS establishment	percent of total BG or BS purchase to be bought there	new priority	displaced priority	owner of BG or BS Establishment
Request adult education teachers	$OTHER	SC1, SC2, or SC3	EA	number of middle-income time units requested	number of high-income time units requested			

MUNICIPAL SERVICES DEPARTMENT: INPUT EXPLANATION FORM

Type of Decision	Code	Decision-Maker	a	b	c	d	e
Purchase or bid on land	$PU	MS1, MS2, or MS3	location	price (in $1000's)	seller (economic decision-maker or department and jurisdiction or OU)	percent of parcel (0 if all)	
Change employment	$CVPT	MS1, MS2, or MS3	E	location of plant	new number of PL's working there	new number of PM's working there	
Change maintenance level	$CVPT	MS1, MS2, or MS3	M	location of plant	new maintenance level		
Change district boundaries	$REDIST	MS1, MS2, or MS3	location of MS plant	list of new parcels in parentheses*			

*Parcels can be listed within parentheses by specifying upper left and lower right hand corners separated by " > ". Example:

$REDIST/=MS/9230,(9232 > 10040)

Type of Decision	Code	Decision-Maker	a	b	c	d	e	f	g
Award BG or BS contracts	$CVPT	MS1, MS2, or MS3	C	location of BG or BS establishment	percent of total BG or BS purchase to be bought there	new priority	displaced priority	owner	
Change salaries	$OTHER	MS1, MS2, or MS3	S	new salary to low-income worker (in $100's)	new salary to middle-income worker (in $100's)				
Construct, upgrade, or demolish an MS plant in the "Outside System"	$OUBLD	MS1, MS2, or MS3	site	MS	old level (0 if new building)	new level (0 if demolition)	maintenance level	new number of PL's working there	new number of PM's working there
Construct, upgrade or demolish MS plant by a local Construction Industry			[see CI owner]						

Type of Decision	Code	Decision-Maker	a	b	c	d	e	f
Transfer cash	$CASH	MS1, MS2, or MS3	C	receiver (economic decision-maker or department and jurisdiction)	amount (in dollars)	from CAPital or CURrent account	if economic decision-maker receiving, PVT; if department receiving, to CAPital or CURrent account	

HIGHWAY DEPARTMENT: INPUT EXPLANATION FORM

Type of Decision	Code	Decision Maker	a	b	c	d	e
Purchase or bid on land	$PU	HY1, HY2 or HY3	location	price (in $1000's)	seller economic decision-maker or department and jurisdiction or OU)	percent of parcel (o if all)	
Change Maintenance Level	$OTHER	HY1, HY2 or HY3	M	new maintenance level	type of road (1, 2, or 3)		
Construct, upgrade or demolish a road or terminal by the "Outside System"	$OUBLD	HY1, HY2 or HY3	site location	HY if road TM if terminal	old level (0 if new road or terminal)	new level (0 if demolition)	if on jurisdiction boundary, jurisdictio numbers, separated by commas
Construct, upgrade or demolish a road or terminal by the local construction Industry	[See CI owner]						
Request federal-state aid	$FSA	HY1, HY2 or HY3	new level for which aid requested (1, 2, or 3)	list of coordinates of end intersections of straight road sections in parentheses [e.g., $FSA/=HY1/2,(9927, 9931, 9931, 8731)			

HIGHWAY DEPARTMENT: INPUT EXPLANATION FORM

Type of Decision	Code	Decision Maker	a	b	c	d	e
Transfer Cash	$CASH	HY1, HY2 or HY3	C	receiver (economic decision-maker or department and jurisdiction)	amount (in dollars)	from CAPital or CURrent account	if economic decision-maker is receiving, PVT; if department is receiving, to CAPital or CURrent account

PLANNING AND ZONING DEPARTMENT: INPUT EXPLANATION FORM

Type of Decision	Code	Decision-Maker	a	b	c	d	e
Purchase or bid on land	$PU	PZ1, PZ2, or PZ3	location	price (in $1000's)	seller (economic decision-maker or department and jurisdiction or OU)	percent of parcel (0 if all)	
Change zoning	$CVPT	PZ1, PZ2, or PZ3	Z	location	new zoning code		
Request Federal-state aid	$FSA	PZ1, PZ2, or PZ3	amount (in $1000's)	[maximum 3 requests]			
Transfer cash	$CASH	PZ1, PZ2, or PZ3	C	receiver (economic decision-maker or department and jurisdiction)	amount (in dollars)	CAP	if economic decision-maker is receiving, PVT if department is receiving, to CAPital or CURrent account
Create public institutional land use	$CVPT	PZ1, PZ2, or PZ3	PI	location	percent to be added to public institutional		
Demolish public institutional land use	$CVPT	PZ1, PZ2, or PZ3	RPI	location	percent to be subtracted from public institutional		

UTILITY DEPARTMENT: INPUT EXPLANATION FORM

Type of Decision	Code	Decision-Maker	a	b	c	d	e
Purchase or bid on land	$PU	UT1, UT2, or UT3	location	price (in $1000's)	seller (economic decision-maker or department or OU)	percent of parcel (0 if all)	
Change utility service	$CVPT	UT1, UT2, or UT3	US	location	location of plant serving	new level of service	
Change prices	$OTHER	UT1, UT2, or UT3	P	new price per unit of utility service			
Construct, upgrade or demolish a utility p plant	$OUBLD	UT1, UT2, or UT3	site location	UT	old level (0 if new plant)	new level (0 if demolition)	
Transfer cash	$CASH	UT1, UT2, or UT3	C	receiver (economic decision-maker or department and jurisdiction)	amount (in dollars)	from CAPital or CURrent account	if economic decision-maker receiving, PVT; if department receiving, to CAPital or CURrent account

BUS COMPANY: INPUT EXPLANATION FORM

Type of Decision	Code	Decision-Maker	a	b	c	d	e
Change routes or level of service	$ROUT	BUS	route number	old level of service	new level of service (0 if eliminating route)	list, in parentheses, of intersections in order, where bus starts, turns, and finishes (0 if no changes to route location	0
Transfer cash	$CASH	BUS	C	receiver (economic decision-maker or department and jurisdiction)	amount (in dollars)	from CAPital or CURrent account	if economic decision-maker receiving, PVT if department receiving, to CAPital or CURrent account
Purchase Rolling Stock	$OTHER	BUS	PS	number of units of equipment			
Sell Rolling Stock	$OTHER	BUS	SS	number of units of equipment			

Type of Decision	Code	Decision-Maker	a	b	c	d	e
Set fares	$OTHER	BUS	P	base fare per worker, per journey (in ¢)	0	price per mile (in ¢)	
Change salaries	$OTHER	BUS	S	new salary to PM worker (specified as salary per worker in $100's)			
Change maintenance level	$OTHER	BUS	M	new maintenance level			

RAILROAD COMPANY: INPUT EXPLANATION FORM

Type of Decision	Code	Decision-Maker	a	b	c	d	e
Purchase or bid on land	$PU	RAIL	location	price (in $1000's)	seller (economic decision-maker or department and jurisdiction or OU)	percent of parcel (0 if all)	
Build rail lines	$RAIL	RAIL	list of two intersections separated by commas	list of parcels in parentheses from which land is required if line is above ground; if subway, leave blank.			
Build stations	$RAIL	RAIL	location of station				
Purchase stock	$OTHER	RAIL	PS	number of units of equipment			
Sell stock	$OTHER	RAIL	SS	number of units of equipment			
Change fares	$OTHER	RAIL	P	base fare per worker per journey (in ¢)	0	price per mile (in ¢)	

Type of Decision	Code	Decision-Maker	a	b	c	d	e
Change salaries	$OTHER	RAIL	S	new salary to middle income worker (specified as salary per worker in $100's)			
Change maintenance level	$OTHER	RAIL	M	new maintenance level			
Transfer cash	$CASH	RAIL	C	receiver (economic decision-maker or department and jurisdiction)	amount (in dollars)	from CAPital or CURrent account	if economic decision-maker receiving, PVT; if department receiving, to CAPital or CURrent account
Change level of service	$ROUT	RAIL	Route number	old level of service	new level of service (0 if eliminating route)	list of stations (in parentheses)	0

VII. MASTER SHEETS

The Master Sheets contained in this chapter summarize all the numerical parameters necessary for participating in the game. It is hoped that once players have familiarized themselves with the earlier portions of this manual, they can use this and the preceding chapter as reference points when finalizing their decisions.

MASTER SHEET FOR BASIC INDUSTRY

Land Development	HI1	LI1	NS1
Typical Construction Cost	\$105,000,000	\$65,000,000	\$50,000,000
Land Requirement	28%	24%	20%
Depreciation and Maintenance Rates			
Annual Normal (%)	3.1Q	2.6Q	3.0Q
As a Result of MS Quality (%)	.031Q	.026Q	.03Q

[Note: $Q = \frac{\text{MS Use Index} - 100}{100}$]

	HI1	LI1	NS1
Income			
Maximum Output (design capacity)	1000 units	1000 units	1000 units
Average Price per Unit (set by "Outside System"	\$190,000	\$115,000	\$110,000
Average Maximum Gross Income	\$190,000,000	\$115,000,000	\$110,000,000
Expenditures			
Employment Requirements			
PH - 120 workers	21(0)	15(0)	23(1)
PM - 160 workers	29(1)	11(1)	9(0)
PL - 200 workers	9(0)	11(1)	9(0)

[Note: Numbers in parentheses indicate part-time employment units.]

	HI1	LI1	NS1
Typical Wage Bill (if at full employment and typical salaries of \$10,000, \$5,000 and 2,500 are offered)	\$53,700,000	\$33,600,000	\$40,500,000
BG and BS Requirements			
For 1% Maintenance and/or Renovation			
BG:	9 units	4 units	1 unit
BS	1.5 units	2.5 units	4 units

Master Sheet for Basic Industry - (Cont'd)

for Normal Operations	HI1	LI1	NS1
BG	420 units	190 units	60 units
BS	60 units	100 units	230 units

[Note: BG and BS can be purchased either from local BG and BS establishments at competitive prices or from the outside system at a fixed price of $130,000 per unit.]

	HI1	LI1	NS1
Utility Requirements	402 units	135 units	76 units

[Note: The price for utility service is set by the Utility Department. The "typical" price is $10,000 per unit.]

Transportation Charges per Mile Along HY3 to:	HI1	LI1	NS1
BG	$500/CU	$500/CU	$500/CU
BS	$500/CU	$500/CU	$500/CU
Terminal	$850,000	$256,000	--------

[Note: An HY3 is the least expensive road. Charges are double on an HY2 and triple on an HY1.]

Taxes

Local Property Sales	Local tax rates are set by the Chairman
Federal and State Business Income (State)	5% of (gross income minus salaries, minus goods and services payments, minus maintenance payments, minus state sales tax and local sales tax, and minus property tax).
Business Income (Federal)	22% of first $25,000 of (gross income minus salaries, minus goods and services payments, minus maintenance payments, minus state sales tax, minus local sales tax, minus property tax, minus state income tax) Plus 48% of rest (minus the same deductions).
Sales Tax (State)	3% of the total purchases of BG and BS.

MASTER SHEET FOR THE CONSTRUCTION INDUSTRY

Land Development	CI1
Development Cost (equipment units)	$120,000,000
Land Requirement	20%
Depreciation (equipment)	
As a Function of Use	.04C*
Capacity (equipment units)	1000
Expenditures	
Employment Requirements	1 population unit of each class per 50 units of labor
Typical Wage Bill (if typical salaries of $10,000, $5,000 and $2,500 are offered)	$2,500,000 per 50 units of labor
Per unit of Equipment	
BG	.44 units
BS	.06 units

[Note: BG and BS may be purchased either from local BG and BS establishments at competitive prices or from the "Outside System" at "fixed cost" of $130,000 per unit.]

Transportation Charges per mile along HY3 per CU of construction	
to BG:	$220
to BS	30
to Build Site	60

[Note: A HY3 is the least expensive road to travel. Costs are double on a HY2 and triple on a HY1.]

$$*C = \frac{\text{equipment units used}}{\text{design capacity}}$$

Master Sheet for the Construction Industry -- Cont'd

Taxes	
Local	
Property	Local Tax Rates are set by the Chairman
Sales	
Federal and State	
Business Income (State)	5% of (gross income minus salaries, minus goods and services payments, minus maintenance payments, minus state sales tax and local sales tax, and minus property tax).
Business Income (Federal)	22% of first $25,000 of (gross income minus salaries, minus goods and services payments, minus maintenance payments, minus local sales tax, minus state sales tax, minus property tax, minus state income tax) plus 48% of rest (minus the same deductions).
Sales Tax (state)	3% of the total purchases of BG and BS.

MASTER SHEET FOR THE CONSTRUCTION INDUSTRY

Construction Capacity Requirements

Land Use	Construction Units of Equipment	Units of Material	Units of Labor	Demolition Units of Equipment	Demolition Units of Material
Basic Industry					
HI1	525	525	525	105	359
LI1	325	325	325	65	222
NS1	250	250	250	50	171
Local Service Industry					
BG1	125	125	125	25	86
BS1	50	50	50	10	34
PG1	150	150	150	30	103
PS1	50	50	50	10	34
Residences*					
RA1	5	5	5	1	3
RB1	30	30	30	6	21
RC1	125	125	125	25	86
Public Structures					
SC1	135	135	135	27	92
MS1	150	150	150	30	103
HY1	4	4	4	1	3
TM1	70	70	70	14	42

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*These requirements of equipment, materials, and labor are for residence construction at QI = 100. But new housing can be built at a lower quality index (as low as QI = 40). Requirements diminish according to the equation: $R = 1/200\ S(100 + X)$ where S is the units of equipment and material or the units of labor required to build a residence at QI = 100 and R is the units required to build the same type of residence at QI = X. Using an RC1 as an example, the requirements at QI = 80 are 113, at QI = 60 are 100, and at QI = 40 are 80.

MASTER SHEET FOR COMMERCIAL ESTABLISHMENTS

	BG1	BS1	PG1	PS1
Land Development				
Typical Construction Cost	\$25,000,000	\$10,000,000	\$30,000,000	\$10,000,000
Land Requirements	24%	20%	16%	12%
Depreciation and Maintenance				
Depreciation Rates				
Annual Normal (%)	1.5Q	2.0Q	1.6Q	2.2Q
As Result of MS Quality (%)	.025Q*	.03Q	.026Q	.032Q
As Result of Use	.015C**	.02C	.016C	.022C

[Note: $*Q = \frac{\text{MS Use Index} - 100}{100}$

$**C = \frac{\text{(Actual Use of Commercial Establishment)}}{\text{(Effective Capacity of Commercial Establishment)}} - 1$

	BG1	BS1	PG1	PS1
Income				
Design Capacity (units)	5,000	1,500	16,000	8,000
Typical Price per unit	\$100,000	\$100,000	\$10,000	\$10,000
Typical Maximum Income	500,000,000	150,000,000	160,000,000	80,000,000
Expenditures				
Employment Requirements				
PH - 120 workers:	14(1)	20(1)	8(0)	6(0)
PM - 160 workers:	7(0)	9(0)	13(1)	11(1)
PL - 200 workers:	8(0)	9(0)	22(2)	16(2)

[Note: Numbers in parentheses indicate part-time employment units.]

	BG1	BS1	PG1	PS1
Typical Wage Bill (If at full-employment and typical salaries of \$10,000; \$5,000 and \$2,500 are offered)	\$27,600,000	36,900,000	32,800,000	25,800,000

Master Sheet for Commercial Establishments - (Cont'd)

BG and BS Requirements per unit of output	BG1	BS1	PG1	PS1
For Normal Operation				
Outside	$83,000 (fixed cost)	$58,000 (fixed cost)	----	----
BG	-----	----	.037 units	.03 units
BS	-----	----	.017 units	.01 units
For 1% Renovation & Maintenance				
Outside	$250,000 (fixed cost)	$100,000 (fixed cost)	----	----
BG			2 units	.75 units
BS			1 unit	.25 units

[Note: BG and BS can be purchased from either local BG and BS establishments (except for BG and BS establishments which cannot purchase from themselves) at competive prices or from the "Outside System" at a fixed cost of $130,000 per unit.]

	BG1	BS1	PG1	PS1
Utility Requirements	112 units	71 units	99 units	77 units

[Note: The price for utility service is set by the Utility Department. The "typical" price is $10,000 per unit.]

Transportation Charges Per unit of output Per mile on HY3	BG1	BS1	PG1	PS1
from Terminal	$400			
to BG			$17	$15
to BS			8	5

[Note: An HY3 is the least expensive road. Costs are double on an HY2 and triple on an HY1.]

Taxes
Local
Property — Local tax rates are set by the Chairman
Sales

Master Sheet for Commercial Establishments - (Cont'd)

Federal and State	
Business Income (State)	5% of (gross income minus salaries minus goods and services payments, minus maintenance payments, minus state sales tax and local sales tax, and minus property tax).
Business Income (Federal)	22% of first $25,000 of (gross income minus salaries, minus goods and services payments, minus maintenance payments, minus state sales tax, minus local sales tax, minus property tax, minus state income tax) plus 48% of rest (minus the same deductions).
Sales Tax (State)	3% of the total purchases of BG and BS.

MASTER SHEET FOR RESIDENCES

Land Development	RA1	RB1	RC1
Typical Construction Cost (at VR = 100)	$1,000,000	$6,000,000	$25,000,000
Land Requirement	12%	12%	12%
Depreciation and Maintenance			
Depreciation Rates			
Annual Normal (%)	2Q	3Q	4Q
Result of MS Quality (%)	.01Q	.01Q	.01Q

[Note: $Q = \frac{\text{MS Use Index - 100}}{100}$

Design Capacity			
PH	1	6	25
PM	1.5	9	37.5
PL	2	12	50
Rent			
Typical Rents/PL1			
PH tenants	$165,000	$165,000	$165,000
PM tenants	150,000	150,000	150,000
PL tenants	140,000	140,000	140,000
Income-Typical Rent at Design Capacity			
PH	330,000	1,980,000	8,250,000
PM	300,000	1,800,000	7,500,000
PL	280,000	1,680,000	7,000,000
Expenditures			
PG and PS requirements			
For 1% Renovation or Maintenance			
PG	.7 units	4 units	17 units
PS	.3 units	2 units	8 units

[Note: PG and PS may be purchased either from local PG and PS establishments or from the "Outside System" at a fixed price of $13,000 per unit.]

Utility Requirements	4 units	26 units	117 units

[Note: Prices for utility service are set by the Utility Department. The "typical" price for a unit of service is $10,000.]

Master Sheets for Residences - (Cont'd)

Taxes	
Local	
Property Sales	Local tax rates are set by the Chairman
Federal and State	
Business Income (State)	5% of (gross income minus salaries, minus goods and services payments, minus maintenance payments, minus state sales tax and local sales tax, and minus property tax).
Business Income (Federal)	22% of first $25,000 of (gross income minus salaries, minus goods and services payments, minus maintenance payments, minus state sales tax, minus local sales tax, minus property tax, minus state income tax). plus 48% of rest (minus the same deductions) 3% of the total purchases of PG and PS.
Sales Tax (State)	3% of the total purchases of PG and PS.

MASTER SHEET FOR SOCIAL SECTOR

	PH	PM	PL
Population Characteristics	High	Middle	Low
Number of People	500	500	500
Number of Workers	120	160	200
Number of Students	130	140	100
Normal Number of Registered Voters	200	140	100
Educational Range	70-99	40-69	0-39
Economic Characteristics			
Typical Salary per Worker	$10,000	$5,000	$2,500
Typical Salary per Population Unit	1,200,000	800,000	500,000
PG and PS requirements			
PG	34 units	28 units	21 units
PS	16 units	11 units	7 units

[Note: PG and PS may be bought from local PG and PS establishments at competitive prices (about $10,000 per unit) or from the "Outside System" at a fixed price of $13,000 per unit.]

	PH	PM	PL
Typical Rents	$330,000	$200,000	$140,000

[Note: Rents are set by economic decision-makers. Actual rents may range above or below these figures.]

	PH	PM	PL
Transportation Charges			
Travel to Work by			
Auto			
Base Cost	$210/worker	$190/worker	$140/worker
+			
Mileage Cost on			
HY1	$60/worker/mile	$55/worker/mile	$50/worker/mile
HY2	$50/worker/mile	$45/worker/mile	$40/worker/mile
HY3	$40/worker/mile	$35/worker/mile	$30/worker/mile

Travel to Work by Bus — Rates set by Bus Company

Travel to Work by Rail — Rates set by Railroad Company

	PH	PM	PL
Travel to PG by Auto			
Cost per Mile on HY3:	$50 per Unit Consumed	$50 per Unit Consumed	$50 per Unit Consumed

Master Sheet for the Social Sector (cont'd)

	PH	PM	PL
Extra Work			
Units of Time for Full-Time Job	80	80	80
Typical Salary per time unit	$15,000	$10,000	$6,250
Adult Education			
Annual Time Units required to maintain maximum education level	27	20	26
Cost per Time Unit for private adult education	$3,000	$3,000	$3,000
Politics			
Units of Time for 7% increase in voters	10	10	10
Units of time for 10% increase in voters	50	50	50
Units of time for 15% increase in voters	60	60	60
Recreation			
Units of PG per unit of time	.1	.05	.025
Units of PS per unit of time	.075	.05	0

MASTER SHEET FOR THE SCHOOL DEPARTMENT

General Characteristics

	SC1
Land Development	
Typical Construction Cost	$27,000,000
Land Requirement	16%
Depreciation and Maintenance	
Annual Depreciation Rate	2%
BG and BS Requirements	
For 1% Renovation or Maintenance	
BG	2 units
BS	.7 units
For Normal Operation	
BG	8 units
BS	3 units
Federal-State Aid	
Capital	$1 for every local $1
Current (automatic)	$225 per student

Design Capacity (students) as a Function of Employment Mix

PM Teacher Units	0	1	2	3	4	5	6
PH Teacher Units							
0		2,520	4,140	6,840	9,900	12,240	13,140
1	3,600	5,910	8,460	11,200	13,320	15,300	17,100
2	7,200	9,900	12,600	15,500	17,460	19,440	21,240
3	10,800	14,040	16,920	20,000*	21,960	23,760	25,560
4	13,140	17,460	21,060	23,400	25,200	27,000	28,620
5	17,100	20,700	23,400	26,640	28,440	30,000	31,500
6	19,800	23,850	26,820	29,880	31,320	32,850	34,200

*The least cost design capacity of an SC1

[Note: There are 120 teachers in a PH and 160 teachers in a PM.]

Master Sheet for the School Department -- Cont'd)

Population Unit Characteristics

Characteristics	PH	PM	PL
Number of students	130	140	100
Criteria for Refusal attend Public Schools			
Value Ratio (Min.)	80	60	
Student-Teacher Ratio (Maximum)	18:1	22:1	
Ratio of High to Middle Teachers (Minimum)	1:1	3:4	
Cost of Private Education (for students)	$37,500	$25,000	$12,500

Capital Federal-State Aid

1st Request: 60% chance of acceptance when students/school = 18,000

2nd Request: 40% chance of acceptance when students/school = 18,000

3rd Request: 30% chance of acceptance when students/school = 18,000

MASTER SHEET FOR MUNICIPAL SERVICES DEPARTMENT

General Characteristics

Land Development	MS 1
Typical Construction Cost	$30,000,000
Land Requirement	12%
Depreciation and Maintenance	
Annual Depreciation Rate	3.3%
BG and BS Requirements	
For 1% Renovation or Maintenance	
BG	2 units
BS	1 unit
For Normal Operation	
BG	7 units
BS	3 units

Design Capacity (MS units) as a Function of Employment Mix

PL Worker Units	0	1	2	3	4	5	6
PM Worker Units							
0		140	230	380	500	680	730
1	200	330	470	620	740	850	950
2	400	550	700	860	970	1,080	1,180
3	600	780	940	1,100*	1,220	1,320	1,420
4	730	970	1,170	1,300	1,400	1,500	1,590
5	950	1,150	1,300	1,580	1,580	1,670	1,750
6	1,100	1,325	1,490	1,660	1,740	1,825	1,900

[Note: There are 160 workers in a PM and 200 workers in a PL.)

*The least cost design capacity of MS1

Drain on Municipal Services

Land Use	Drain of MS Units
HI1	105
LI1	65
NS1	50

Master Sheet for Municipal Services Department -- Cont'd

Drain on Municipal Services (Cont'd)

Land Use	Drain of MS Units
BG1	25
BS1	10
PG1	30
PS1	10
RA1	10
RB1	60
RC1	250

MASTER SHEET FOR THE HIGHWAY DEPARTMENT

General Characteristics

	HY1	TM1
Land Development		
Typical Construction Costs	$800,000	$14,000,000
Land Requirements	8% from 2 sides	12% from 4 sides

[Note: Land requirements for HY2 are 12% and for HY3 are 16% (from both sides of roadbed) and for TM2 are 16% and TM3 are 20% (from all four corners).]

Depreciation and Maintenance		
Depreciation due to Use	5.0Z	None

[Note: Z = actual use/effective capacity; it is not applicable unless Z > 0]

BG and BS Requirements For 1% Renovation or Maintenance		
BG	$7000/mile (fixed cost)	---------
BS	$1000/mile (fixed cost)	---------
Design Capacity	500 units per mile	10,000 units
Road Unit Consumption per Mile		
To Work by Auto	10 units per population unit	
To Work by Bus		
Level 1	50 units	
Level 2	100 units	
Level 3	150 units	

Master Sheet for the Highway Department (Cont'd)

	HY1	TM1
Terminal Unit Consumption		
by: HI1		3000 units
LI1		1000 units
BG1		1 unit per CU sold
Federal-State Aid (for approved construction projects)		
HY1	$1 for every local $9	
HY2	1 for every local 1	
HY3	2 for every local 1	

MASTER SHEET FOR PLANNING AND ZONING

Zoning Classification

Land Use	Classification
Any Use	00 or ---
Any Business	10
Any Manufacturing	20
HI	21
LI	22
CI	23
Any Commercial	30
NS	31
BG	32
BS	33
PG	34
PS	35
Any Residential	40
RA	41
RB	42
RC	43
Parkland	50

Federal-State Aid is available for purchase of land with the probability that aid will be granted increasing as the amount of the request decreases and existing ratio of population/square mile of parkland increases

MASTER SHEET FOR THE UTILITY DEPARTMENT

General Characteristics

Level of Service	Installation Costs paid to Outside	Maximum Amount of Utility Units Installed
Level 1	2,000,000	100
Level 2	4,000,000	200
Level 3	5,000	300
Level 4	6,000,000	400
Level 5	8,000,000	500
Level 6	11,000,000	600
Level 7	14,000,000	700
Level 8	18,000,000	900
Level 9	28,000,000	1,300

Variable Cost Function of a UT1

Utility Units Served	Per Unit Operating Costs	Total Operating Costs
300	$20,000	$6,000,000
600	13,333	8,000,000
900	9,630	8,666,667
1200	7,778	9,333,333
*1500	*6,667	*10,000,000
1800	7,407	13,333,333
2100	7,936	16,666,666
2200	8,080	17,777,778
2500	8,444	21,111,111
2800	8,730	24,444,444

*The least cost design capacity of a UT1.

Utility Units Consumed

Land Use	Consumption
Basic Industries	
HI1	402
LI1	135
NS1	76
Commercial Establishments	
BG1	112
BS1	71
PG1	99
PS1	77

Utility Units Consumed (Cont'd)

Residences	
RA1	4
RB1	26
RC1	117

NOTE: Typical price for utility service is $10,000 per unit. The construction cost of a utility plant is $120,000,000. Utility plants must be built by the Outside.

MASTER SHEET FOR BUS COMPANY AND RAIL COMPANY

General Characteristics

Characteristics	BUS	RAIL
Land Development		
Typical Development costs		
Underground tracks		$14,000,000/mi.
Surface tracks		4,000,000/mi.
Stations		1,000,000
Land requirements		4% surface tracks (for one side only)
Operating Expenses		
Fixed cost of equipment per mile	$400,000 (40 units)	$800,000 (80 units)
Employment		
Typical cost of labor per mile	40,000	40,000
Units of labor required per mile	50	50
[Note: Bus and Rail hire middle income (PM) workers only. There are 160 workers in a PM. The typical salary per worker is $5000. One PM supplies 1000 units of labor and 50 units of labor are required to operate a bus (level 1) and rail (level 1) for one mile.]		
Depreciation and maintenance of equipment		
Average rate (annual)	3.5%	3.5%
BG and BS requirements for 1% renovation or maintenance		
BG	$40/unit of equipment	$40/unit of equipment
BS	$60/unit of equipment	$60/unit of equipment

Master Sheet for Bus Company and Rail Company -- cont'd.

	BUS	RAIL
Passenger Capacity (people)		
When value ratio = 100		
Level 1 Route	3000	6000
Level 2 Route	6000	12000
Level 3 Route	9000	18000

Distance for Diagonal Rapid Rail Segments

		Horizontal Distance Between Stations				
		1	2	3	4	5
	1	1.414	2.236	3.162	4.123	5.099
Vertical	2	2.236	2.828	3.606	4.472	5.385
distance	3	3.162	3.606	4.243	5.000	5.831
between	4	4.123	4.472	5.000	5.657	6.403
stations	5	5.099	5.385	5.831	6.403	7.071